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The Economic Aspect

Keith Bush
Bruce Parrott
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Foreign Technology and the USSR

Philip Hanson
Donald W. Green
Herbert I. Fusfeld
Herbert S. Levine

Samizdat On Science

The case of Igor Melchuk

A View From Inside
Mark Popovsky

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Editorial Office

Ilford House, 133 Oxford Street, London W1R 1TD (Tel. 01-734 0592)

Subscription Office

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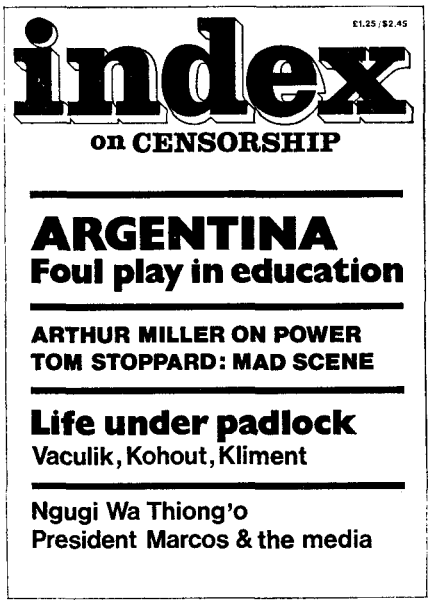

MADMEN AND DISSIDENTS

This issue of *Index on Censorship* contains a scene from Tom Stoppard's latest play, based on the experience of Victor Fainberg in a Soviet institution.

DOCTOR. The idea that all the people locked up in mental hospitals are sane while the people walking about outside are all mad is merely a literary conceit, put about by the people who should be locked up. I assure you there's not much in it. Taken as a whole, the sane are out there and the sick are in here. For example, *you* are here because you have delusions, that sane people are put in mental hospitals.

ALEX. But I *am* in a mental hospital.

Tom Stoppard, *Every Good Boy Deserves Favour*

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Soviet Economic Growth: Past, Present, and Projected

Keith Bush

THE postwar period has witnessed sustained and extensive growth in the principal inputs into the Soviet economy. The following table shows how fixed capital has risen at a higher rate than in most developed economies, while employment has grown even faster than the population of working age.

TABLE 1

The Soviet Economy—Growth of Inputs and Output, 1951–80
(Average Annual Percentage Rate of Growth)

	1951–60	*1961–70*	*1971–75*	*1976–80P*
Inputs				
Net capital stock	9·4	8·1	7·9	6·5
Manhours	1·3	1·8	1·9	1·5
Land	2·4	0·4	0·8	0·5
Factor productivity	1·2	0·8	−0·6	1·5
Output				
GNP (Western concept)	5·8	5·1	3·7	5·0
National income produced (Soviet concept)	10·3	7·2	5·7	4·7

Sources: Drawn or derived from CIA, *Soviet Economic Problems and Prospects*, Washington, 1977, p. 10; *Narkhoz 75*, p. 56; *Pravda*, 27 Oct. 1976.

THE growth record of the Soviet economy is compared with that of its major competitor (see Table II on p. 2).

Overall Soviet economic growth is still clearly subject to considerable annual fluctuations. In large part, these are attributable to the influence of the climate upon agricultural output which accounts for about one-fifth of the gross national product. However, with gross industrial output continuing to grow at a respectable rate, the Soviet economy has not emulated its US competitor in undergoing a recession.

It may be seen that the Soviet economy, if viewed in terms of gross national product, was catching up with that of the US at a rapid pace during the 1950s—a phenomenon which provoked no little concern in the latter country—but the rate of "catching up and overtaking" slowed during the 1960s. Since then, the US has undergone the most severe recession since the 1930s, but the absolute gap between the US and Soviet GNPs has nearly regained the highest level recorded in 1973 and the relation of the Soviet to the US GNP appears to have stabilized at around 55 per cent.

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TABLE II

Real Growth in Soviet and US GNP, 1951–77
(Percentage Growth)

	USSR	*US*
1951–60 average annual	5·8	3·2
1961–65 average annual	4·9	4·7
1966–70 average annual	5·4	3·0
1971	3·9	3·0
1972	1·7	5·7
1973	7·5	5·3
1974	3·8	−1·8
1975	2·3	−2·0
1976 preliminary	3·7	6·2
1977 preliminary	3·1	4·9

Sources: Drawn or derived from CIA, *Handbook of Economic Statistics 1976*, Washington, 1976, p. 34; CIA, *Soviet Economic Problems and Prospects*, Washington, 1977, p. 2; *Pravda*, 28 Oct. 1976; *International Herald Tribune*, 17 Jan. 1977; *The Financial Times*, 26 Apr. 1977, *Pravda*, 15 Dec. 1977.

Table III

The Great Economic Race (Continued)
(in billions of 1975 US$*)

Year	*US*	*USSR*	*Absolute difference*	*USSR as % of US*
1950	679	223	456	33
1960	931	422	509	45
1970	1,359	719	640	53
1971	1,400	745	655	53
1972	1,480	758	732	51
1973	1,559	812	747	52
1974	1,530	847	683	55
1975	1,499	865	634	58
1976 preliminary	1,592	897	695	56
1977 preliminary	1,670	925	745	55

* Soviet GNP computed at US purchasing power equivalents.
Sources: Derived from CIA, *Handbook of Economic Statistics*, Washington, 1976, p. 31 and Table 2.

FOR the purpose of the computations given in Table I, labour is weighted at 55·8 per cent and capital at 41·2 per cent of total factor costs in production, with land accounting for the residual of 3 per cent. It will be seen that the inputs of labour and capital were maintained at a high level through 1975, yet the rate of growth of

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output (GNP) declined markedly. This diminution is attributable to a deterioration in factor productivity, i.e. the effectiveness with which the primary inputs are utilized, from an annual average of + 1·2 per cent in 1951–60 to −0·6 per cent in 1971–75.

The reasons for this decline and for the fall-off of related inputs since the 1950s are many and varied. Some of them follow:

(a) The "catch-up" period after the Second World War was largely over by the end of the 1950s.

(b) The increasing complexities of the planning and management of a command economy were unalleviated by effective computerization.

(c) In this increasingly complex economy, administered prices posed an enhanced burden.

(d) Agricultural policy switched from a ruthless exploitation of the peasantry, from the tribute (*dan*) of the agricultural sector for the financing of forced-draft industrialization, to a growing support for this lagging sector from the rest of the economy. In addition to the highest relative and absolute farm price support bill in the world—the 1975 subsidy on meat and milk reportedly totalled nearly 19 billion rubles,[1] while the sum of all price supports related to agriculture is appreciably higher[2]—plus the allocation of 27 per cent of new investment in the period 1976–80 to "the entire complex of agriculture,"[3] there is the vast albeit incalculable hidden cost of agriculture arising from the requisition of millions of industrial and transport workers and hundreds of thousands of trucks, tractors and other equipment each summer to help out with the harvest.

(e) The "great leap forward" of agriculture in 1953–58 could not be repeated in the 1960s. Some 30 million hectares of new land were brought under the plough during Khrushchev's Virgin Lands campaign. Most of the modest expansion of cultivated land during the 1960s has been offset by land lost to industrial and residential construction. Some of the more marginal virgin lands were withdrawn from cultivation during the 1960s. In response to the harvest shortfalls of the 1970s, almost every available piece of land has been cultivated, including fields due for clean fallow and the verges of roads, railroad tracks and canals.

(f) The workweek for all workers and employees was shortened from 47·8 hours in 1955 to 40·7 hours at present. Longer paid annual vacations were granted: these reportedly now average 19·3 workdays throughout the economy and 18·8 days in industry.[4]

(g) Virtually maximum labour participation has been attained. By 1970, 92·4 per cent of the population of working age, includ-

[1] *Pravda*, 5 Jan. 1977.

[2] See Vladimir G. Treml, *Agricultural Subsidies in the Soviet Union*, US Department of Commerce, Washington, 1975.

[3] *Pravda*, 27 Oct. 1976.

[4] *Trud* v. *SSSR*, p. 241.

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ing full-time students, were employed in the public sector, compared with roughly 76 per cent of the equivalent category in the US.

(h) Labour turnover has increased.

(i) With the exhaustion of the more accessible sites, exploitation has shifted to more remote and more expensive sources of raw materials.

(j) The voice of the consumer began to be heard, and her or his wishes had at last to be considered. It is perhaps easier to increase the output of pig iron than to increase the sales of fashionable shoes once a certain level of supply and of consumer sophistication has been attained.

(k) Repressed inflation has dampened incentive.

(l) Planners have been obliged, belatedly, to pay attention to environmental factors.

THE CURRENT PICTURE

Industry

Paradoxically, the USSR is the world's leading producer of iron ore, pig iron and steel, yet it spends much of its precious hard currency on imports of metal products; for example, nearly all of the pipe imported during 1976 at a total cost of three billion rubles (about $4 billion) came from the West.[5] This is attributable to a combination of factors: the prevailing supremacy of the *val* means that many steel products are unnecessarily heavy; the vast distances between the main fuel producing centres and the consuming regions demand an awful lot of pipe; Soviet technology in the field of rolled steel and pipe-making lags well behind that of the West, while any flaws are dramatically exposed in the climatic extremes of Siberia; and despite the chemicalization drive of the past 14 years, metal is still frequently used where, in the West, chemically derived substitutes would be adopted. Predictably, the response of the Soviet authorities has been to issue decrees,[6] but massive imports are expected to continue in the foreseeable future.

Perhaps the greatest single problem confronting Soviet planners is the forthcoming oil crunch. According to CIA calculations, Soviet oil production is expected to peak, perhaps as soon as this year and certainly not later than in the early 1980s. The maximum level of output reached is likely to be between 550 million tonnes—just above the level attained in 1977[7]—and 600 million tonnes. However, maximum levels are not considered likely to be maintained for long. The Soviet oil industry has two basic problems: one of reserves and one of production. Barring an extremely unlikely discovery of a massive new field close to an existing field, new deposits will not be found rapidly enough to maintain acceptable reserves-to-production ratios, and those fields that

[5] *Vneshtorg 76*, p. 91.
[6] The latest appeared in *Pravda*, 28 July 1977.
[7] *Vestnik statistiki*, No. 7, 1977, p. 90.

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account for the bulk of Soviet production are experiencing severe water encroachment. As a result, increasingly large quantities of water must be lifted for each barrel of oil produced, and high-capacity submersible pumps will be required if production declines are to be staved off even temporarily. Although some substitution of coal and gas for oil in domestic use will be possible in the long run, the effect of such substitution will be minimal in the short run. Neither hydro-electric power transmitted from the East nor the construction of nuclear power plants (mainly in the Western USSR) can be expected to afford much relief for more than a decade.[8] It might be noted that the CIA's sobering prognostications have been challenged, fuzzily by the Soviet media,[9] more concretely by other Western observers,[10] but now they have been partially confirmed by a Soviet spokesman.[11]

The ninth five-year plan for the period 1971–75 was unexampled in that it provided for a higher growth rate for Group B than for Group A industry. In the event, this reversal of the traditional priorities was never implemented; in the first year of the plan period, even before the first major setback of the 1972 harvest, Group A grew faster than Group B, and this ordering was subsequently maintained.[12] The 10th five-year plan for the period 1976–80 makes no pretence to such concessions to the consumer, even if its modest targets for Group B output are declared to be "minimum goals." In 1975, the share of Group A in total industrial production was reported by the TsSU to be 74·0 per cent.[13] However, this proportion is understated in that the residual 26 per cent for the value of Group B output is inflated by the above-average rates of profitability recorded by the food and light industries.[14] On the other hand, it can be, and has been, argued that heavy industry (especially the fuel and mining branches) supplies the bulk of Soviet exports to hard-currency markets and thus pays for the imports of consumer goods (such as grain and meat) together with the raw materials and machinery for their production. Moreover, Group A industry produces a growing share of all consumer goods, from a reported 18 per cent in 1975 to a planned 22 per cent in 1980.[15]

The decisive role in overall economic performance played by the agricultural sector was illustrated by the impact of the grain harvest

[8] CIA, *Prospects for Soviet Oil Production*, Washington, Apr. 1977, p. 9.

[9] For instance, Radio Peace and Progress in English for Asia, 15.30 GMT, 1 Aug. 1977.

[10] See, *inter alia*, *Washington Post*, 12 June 1977; *EastWest Markets*, 25 July 1977; *The Times*, 27 July 1977.

[11] *Baltimore Sun*, 19 Jan. 1978.

[12] See this author's "Is the Ninth Five-Year Plan Consumer-Orientated?" in NATO, *Prospects for Soviet Economic Growth in the 1970s*, Brussels, 1971, pp. 83–90, and "Was the Ninth Five-Year Plan Consumer-Oriented?" in the follow-up volume published in 1975.

[13] *Narkhoz 75*, p. 192.

[14] 28·7 per cent and 24·0 per cent respectively, against an industrial average of 15·8 per cent: *Narkhoz 75*, p. 728.

[15] *Sotsialisticheskaya industriya*, 16 Mar. 1976.

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shortfall of 1975. In its wake, industrial growth in 1976 was the lowest in peacetime history.

The leading growth branches in 1976–80 are scheduled to be chemicals, with a 10·2 per cent, and machinery, with a 9·2 per cent, planned average annual growth rate.[16] Both branches utilize appreciable inputs of Western technology, while one-third of the output of the machine-building and metal-working sector goes to defence. In this connection, the recent belittling of the impact of imported technology is somewhat misleading: consider, for instance, the repercussions of the Tol'yatti plant upon the Soviet economy and on Soviet society.

The level of mechanization and automation of Soviet industry and construction remains substantially behind that of most Western countries, with over one-half of industrial workers still engaged in manual labour. And despite the designation of the 10th five-year plan as "the plan of quality and effectiveness," with the quality-mix of output now employed as a principal success indicator, together with a plethora of decrees "decreeing" higher quality output,[17] there is little evidence to suggest that quality has replaced quantity (or the *val*) as the prime criterion of industrial performance.[18]

Agriculture

The Soviet Union is comparatively poorly endowed in terms of agricultural land and climate, and thus under any organizational system agricultural labour and agricultural productivity would probably be much lower than, say, in the US or in Western Europe. But the recent setbacks in the face of an unwavering commitment of capital resources under the present leadership raise a whole series of nagging and legitimate questions. Just what is that one-third of the workforce up to? Can the planners maintain the share of scarce resources being allocated to that seemingly bottomless slough of despond? (In absolute terms, productive investment in agriculture in the USSR is currently estimated as being about five times higher than in the US.[19]) Will a future Soviet leadership, that has no personal political capital invested in collectivization, dare to break down the gigantic *sovkhozes* and *kolkhozes* into more manageable sub-units and give farmers meaningful operational autonomy?

In sharp contrast to his earthy and unpredictable predecessor, Brezhnev has been remarkably consistent in his agricultural policy. All of the major provisions of the March 1965 programme are still being implemented faithfully in 1978. Over one-quarter of total new

[16] *Pravda*, 27 Oct. 1976.
[17] See, for instance, *Ekonomicheskaya gazeta*, No. 3, 1977, p. 5 and *Pravda*, 3 Feb. 1977.
[18] Cf. RL 87/77, "New Success Indicators in Soviet Industry," 15 Apr. 1977.
[19] JEC, *Allocation of Resources in the Soviet Union and China—1976*, Washington, 1976, p. 43.

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investment will go to agriculture in 1976–80, including 40 billion rubles on land improvement programmes alone. Procurement prices have been repeatedly raised until they are among the highest in the world. Millions of new tractors, trucks and combines have been delivered to farms, whose inventories are gradually approaching the "optimal parks."[20] Feasibility studies are going ahead on grandiose plans to divert the flow of north-flowing rivers to the parched terrain of Central Asia, yet realization must be decades away. Livestock complexes are growing larger, although the sharp falling off of animal products coming to the market last year led the authorities to check the concentration drive and, instead, to display almost benevolent encouragement for the private livestock holdings. Finally, the record grain harvest of 1976 emboldened the planners to raise their sights somewhat: the new average output target for grain in 1976–80 is now 220·4 million tons (in place of 215–220 million tons) and for meat 16·0 million tons instead of 15·0–15·6 million tons.

Consumption

After a decade when *per capita* consumption grew both substantially (over 3 per cent per annum) and visibly (e.g. new housing, motor cars, other consumer durables, soft goods and meat), the *per capita* consumption of all goods and services in 1976 rose by only one per cent, largely attributable to a 3 per cent drop in food consumption.[21]

In absolute terms, and by any static comparison with the West, living standards for the bulk of the Soviet population are wretchedly low. A juxtaposition of some of the salient indicators of the quality of life in the Soviet Union with those prevailing in the West puts Soviet conditions ahead only in respect to job security (admittedly most important), formal weekly working hours, the numbers of doctors and students per 10,000 of the population and the relation of non-contributory pension payments to final earnings. Soviet consumers are well behind when it comes to the purchasing power of their wages, the availability and quality of consumer goods and services, minimum wage, the rate of income tax on average earnings and below, the rates of indirect taxation (the turnover tax) on most consumer goods, food consumption and housing.[22]

The widespread and prolonged food shortages of 1975 and 1976 reportedly gave rise to isolated manifestations of popular discontent.

[20] See Radio Liberty Research Supplement, *Soviet Agriculture: Ten Years under New Management*, 23 May 1975, pp. 10–14.

[21] Perhaps for the first time since the war, ration cards were introduced for meat in some regions. A copy of such a card, believed issued in the Perm' Oblast' in late 1976, was reproduced in *Die Welt*, 6 Aug. 1977.

[22] See this author's "Soviet Living Standards: Some Salient Data" in NATO, *Economic Aspects of Life in the USSR*, *Brussels*, 1975, pp. 49–64 and "Retail Prices in Moscow and four Western Cities in May 1976," in *Osteuropa Wirtschaft*, No. 2, 1977, pp. 122–141.

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For instance, absenteeism in Tula, when workers filed off the job so that they could shop in the better-stocked stores in Moscow, led in a roundabout route to the award of the title "Hero City." Baltic dockers staged go-slow strikes and refused to unload imported foodstuffs that were destined for the limited-access stores patronized by privileged members of Soviet society.[23] Four Latvian dockers were reportedly jailed for having struck in protest against meat shortages.[24] And a comprehensive survey of foodstuffs on sale in the state retail stores of Moscow—the best supplied city in the USSR—in May 1976 found no trace of, *inter alia*, poultry, carrots, coffee, pepper, butter, kefir, onions, potatoes, apples, lemons (or indeed any other tropical fruit), steak, cheese and cooking oil.[25]

While Soviet shoppers are occasionally confronted with overt retail price increases, such as those announced in January 1977 and again in March 1978,[26] they are well aware that the principal erosion in their purchasing power stems from covert inflation in the prices of "new" and "improved" products. The coveted Zhiguli offers a good example. The basic model is the VAZ-2101, which retails for 5,500 rubles. Subsequent and slightly improved models sell for much more: for instance, the VAZ-21011 now sells for 6,030 rubles, and the VAZ-2103 retails for 7,500 rubles.[27] Most aspiring car owners would, however, be perfectly happy, indeed ecstatic, with the cheapest model; after all, 5,500 rubles represents over three years' take-home pay for the average Soviet industrial worker.[28] But the majority of those on the waiting list cannot buy the VAZ-2101 any more, since the output of this model has been cut back (by nearly one-half in 1975), while the production of the 2103 and 21011 is rising rapidly.[29] What is more, most of the remaining VAZ-2101 output is earmarked for the markets of East and West Europe! This kind of creeping—or perhaps galloping—inflation can set the would-be driver back by a small fortune. And much the same kind of process may be observed for a whole range of consumer goods and services.

Most Soviet citizens are by now well aware that their living standards are markedly inferior to those prevailing in socialist neighbours such as Hungary, the GDR and Czechoslovakia, and that they are just not in the same league as those in the crisis-ridden and decaying capitalist societies of the West. However, particularly during the past 12 years or so they have been at least partially consoled by the realization of how much better off they are now than they or their

[23] *Die Welt*, 2 June 1977.

[24] See. for example, *The New York Times*, 31 Oct. 1976; *The Times*, 1 Nov. 1976; *International Herald Tribune*, 2 Nov. 1976; cf. AS 2742.

[25] "Retail Prices in Moscow . . .," op cit.

[26] *Pravda*, 5 Jan. 1977.

[27] The latest retail prices are taken from the lottery lists in *Pravda vostoka*, 21 Aug. 1977 and *Sovetskaya Rossiya*, 2 Sept. 1977.

[28] The calculations are spelled out in "Retail Prices in Moscow . . .," op. cit.

[29] *Za rulem*, No. 6, 1976, p. 7.

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parents were. Twenty years ago, for instance, most families shared apartments; now most families have their own front door. Fifteen years ago, a private motor car was an unattainable dream for most citizens; now practically everyone has at least a relation or an acquaintance who drives one. The consolation has been buttressed by the propagation and amplification by the Soviet media of the very real woes afflicting their Western counterparts in the shape of mass unemployment, inflation and declines in real incomes. But any prolonged and marked slowdown in the improvement in living standards, running counter to rising expectations, could switch attention from internal to external comparisons. And this could bring trouble.

Defence

After an agonizing reappraisal, the CIA has revised its estimates of Soviet defence expenditure sharply upward. This revision is reportedly attributable to a reassessment of the efficiency of the defence sector and changes in pricing defence goods, together with the escalating costs of new and more complex weapons systems. The latest "best Western estimate" is: defence expenditures now absorb between 11 and 13 per cent of the Soviet GNP; they have been rising by 4–5 per cent annually in real terms during the past few years; this present upward momentum is likely to continue during the immediate future because of programmes already in motion; estimated dollar costs of Soviet defence exceeded US outlays by some 40 per cent in 1976 (30 per cent if military retirement programmes are included); defence takes a large share of the products of major investment goods industries such as machine-building (one-third), metallurgy (one-fifth), chemicals (one-sixth) and energy (about one-sixth); defence has a heavy impact on high-technology areas where it has a priority claim on manpower and output.[30]

While the overall GNP was growing at annual rates of 4–5 per cent, a defence bill that also increased at much the same pace was onerous but tolerable. But if the GNP growth rate slows to 3 per cent or less, then clearly defence must increasingly pre-empt resources which would otherwise go to investment (i.e. future growth) and/or consumption.

Here again it should be recorded that the CIA's "new" estimates of Soviet defence expenditures are challenged by some Western observers as being still too low. One of the Agency's most vocal critics is W. T. Lee, who calculated defence to take 14–15 per cent of

[30] See CIA, *A Dollar Cost Comparison of Soviet and US Defense Expenditures*, Washington, Jan. 1977; JEC, *Allocation of Resources in the Soviet Union and China*, Washington, June 1977; CIA, *Soviet Economic Problems and Prospects*, Washington, Aug. 1977.

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the Soviet GNP in 1975 and who expects this burden to rise to over 20 per cent by 1980.[31]

Foreign Trade

The volume and value of foreign trade has continued to grow at a faster rate than the GNP, so that it has an increasing impact upon domestic production and consumption. The most notable development in recent times in Soviet trade with its East European partners has been the growing dissatisfaction of the junior partners in Comecon with the inadequate supplies of Soviet oil and grain, together with a reported reluctance to participate in joint investment projects on Soviet territory to the extent desired by the host country. However, in any study of economic growth, attention should perhaps be focused on Soviet trade with the developed West, for the Soviet economy will have a continuing requirement for as much Western expertise and equipment as the Soviet hard-currency balance can afford and as the economy can absorb and diffuse. Both of these constraints are formidable, although only the former is quantifiable to any degree of accuracy.

After two years of large hard-currency deficits, the Soviet payments position improved somewhat in 1977. Moscow's net hard-currency debt is believed to have risen to about $17 billion. Approximately one-half of the USSR's hard-currency earnings in 1976 came from the export of crude oil and petroleum products to non-communist countries. The Soviet debt service ratio, i.e. principal repayments on medium- and long-term debt and interest payments on total debt as a share of merchandise exports, at the end of 1976 has been estimated at 26 per cent.[32] Debt service is expected to rise to $3 billion in 1977 and to almost $4 billion next year.[33]

Reform

The reform of economic planning and management, unveiled by Premier Kosygin at the September 1965 plenum, was a sickly child from birth and never really recovered from the reaction of 1968. For all practical purposes, that particular reform is dead although it has not been officially buried. One of its prime features was a judicious mix of centralization and decentralization. Thus, while branch ministries recovered all of their previous powers and more, the individual enterprise was at the same time to be granted more autarky in its day-to-day operations. In practice, the decision-making powers of the enterprise manager were further eroded and circumscribed. This latter

[31] W. T. Lee, "Soviet Defense Expenditures," *Osteuropa Wirtschaft*, No. 2, 1976, and "Soviet Defense Expenditures in the 10 FYP," ibid. No. 4, 1977.
[32] CIA, *USSR: Hard Currency Trade and Payments, 1977–78*, Washington, Mar. 1977, p. 17.
[33] Ibid. p. 10.

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process has been accentuated and expedited with the grouping together of the already (by Western standards) large individual enterprises into gigantic production associations.

This organizational form was first introduced in 1961. It underwent an eclipse during the first flush of the implementation of the 1965 reform but has moved steadily forward since its endorsement at the 24th and 25th Congresses of the CPSU. It is currently scheduled to be adopted throughout industry by 1980, although at mid-1977 complaints were rife regarding foot-dragging in the creation and running of associations.[34] The already tenuous link between effort and reward for the mass of industrial workers and employees has been further obfuscated by the inevitable levelling that takes place in the vast conglomerates. In any case, wage increases have been held down in order not to exacerbate the existing degree of repressed inflation, and it looks as if higher productivity is to be induced not so much through higher wages as by means of exhortations, spurious "Socialist Competitions" and "spontaneous" pledges. In place of a realistic reform, a plethora of limited and local experiments is being tried out in industry and construction, including the "Shchekino," "Aksai," "Zlobin," "VAZ," and "Belorussian" models. But, as two distinguished observers pointed out recently on the pages of *Izvestiya*, despite the impressive successes recorded by these methods, their scale has been kept so modest that they have had little impact upon industrial growth and effectiveness.[35]

An authoritative pronouncement by no less than the head of the USSR Gosplan bore testimony to the demise of the spirit of the September 1965 reform. In March 1976, Baibakov wrote: "At the bases of the successes of socialism's planned economy is the Socialist social structure and Socialist ownership of the means of production, which *wholly eliminates the influence of the law of the jungle and of market chaos.*"[36]

Roughly parallel developments with industry may be observed in the agricultural sector. Although many Soviet and Western critics might argue that a major source of weakness is the excessive size and unwieldiness of the basic production unit, with some *kolkhozes* encompassing over 50 villages separated by rivers and forests, the present trend is towards even larger inter-farm organizations and agro-industrial complexes, although a "pause" was evidently decreed after the excesses of 1976.[37] At the same time, considerable leeway has been granted to some local authorities to experiment with variations on the theme of the normless *zveno*. This is a small team of

[34] See, for instance, *Pravda*, 11 June 1977.
[35] *Izvestiya*, 23 June 1977.
[36] *Sotsialisticheskaya industriya*, 31 Mar. 1976 (emphasis supplied); cf. *Pravda*, 10, 11, and 12 Nov. 1977.
[37] See *Pravda*, 26 Oct. 1976; cf. *Kazakhstanskaya pravda*, 18 Nov. 1976; *Pravda vostoka*, 26 Nov. 1976; *Zarya vostoka*, 2 Feb. 1977.

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farmers that is allocated a given area of land and some farm machinery for a period of several years and allowed to retain the "surplus product" after a given delivery target has been met.

THE present climate of thought does not appear to be conducive to reform. Although at the very top, gerontocracy does not like change, the system's managers at the middle and lower levels surely realize that the Soviet command economy is extremely wasteful, inflexible and inefficient. Yet there are a host of objective constraints upon reform. For instance, economic reform threatens political control. Private enterprise offends ideology. The untrammelled play of market forces would displace bureaucrats, cause disruption and give birth to mass unemployment. Large differentials in earnings would give rise to jealousy and discontent—perhaps shared misery is less disruptive? Planners' preferences would have to give way to consumers' choices, paving the way for "anarchy". Small wonder that the old men in the Kremlin have put reform on the back-burner and are leaving these painful decisions for their successors. They are also comforted in their caution by the less than impressive performance of the mixed market economies in recent years.

PROSPECTS

With all of his failings, Khrushchev managed to detach himself on occasions from the day-to-day political hurly-burly to look ahead at the Promised Land of Full Communism. The principal monument to his visionary zeal, the Party Programme of 1961, has not been completely flushed down the memory hole, but it is seldom mentioned nowadays in polite society.

If his successors have a vision of future Soviet society, then they are keeping it to themselves and not sharing it with those who are most directly concerned, i.e. the Soviet population. Perhaps the inmates of the Kremlin are too preoccupied with their aches and ailments, plus the overwhelming mass of detail involved in reacting to daily pressures? In any case, the long-term plan for 1976–90, that was commissioned at the 24th Party congress, has yet to be unveiled. Indeed, it is by no means certain that any final version of the current medium-term plan for 1976–80 will be published.

NOTWITHSTANDING the hazards involved in projecting the future of a society whose present is so obscured, it is quite possible to outline the rough parameters to economic growth over the next decade or so on the basis of some firm trends and some not-so-firm assumptions. The political and social implications of these growth projections are quite another matter where observers will clearly disagree and where one man's insight is just as good as, and no better than, that of his neighbour.

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Table 1 showed how inputs of capital and labour into the Soviet economy were maintained at a high level from 1951 to 1975 and yet, owing to a fall in factor productivity, the rate of growth of output, i.e. GNP, declined. (The absolute decline in factor productivity growth of −0·6 per cent in 1971–75 was attributable largely to the two exceptionally bad harvests of 1972 and 1975; without these, factor productivity would almost certainly have registered a gain, perhaps of around 0·5 per cent.)

Inputs during the next decade or so may be predicted with a fair degree of probability. As far as capital stock is concerned, even if the current unrealistically low rates of retirement are retained, capital stock will not grow at much more than 6·5 per cent per annum through 1980. And since new investment is planned to increase at an historically low average annual rate of 4·4 per cent in 1976–80, this is bound to work itself out in a further reduction in growth of capital stock in the 1980s, probably to 5·5 per cent per annum in 1981–85.

The prospects for the prime input, that of labour, are much gloomier. The number of man-hours worked has grown steadily from 1961 to 1975 at a steady 1·8–1·9 per cent per annum. The employment ratio of 92·4 per cent recorded by the 1970 census[38] represents virtually the maximum feasible, i.e. few more can be squeezed out of the private sector and those who are will merely offset the increased number of women staying home to bear and to care for children. All future employment growth must therefore stem basically from the natural increase in the population of working age (16–59 for men and 16–54 for women.) These future cohorts are already born and thus we can confidently predict that the population of working age will grow by an average of 1·6 per cent in 1976–80 and by only 0·5 per cent in 1981–85.[39] (The projection for the period 1986–90 is little different.)

The weight of the third input, land, is insignificant (3 per cent) and the expansion of arable land in the foreseeable future is expected to remain at less than 0·5 per cent per annum.

TO sum up: if factor productivity grows at an average of 0·5 per cent per annum in 1976–80, the GNP should increase at an annual average of around 4·0 per cent. With the same growth in factor productivity in 1981–85, GNP growth will fall to about 3·1 per cent.[40]

[38] TsSU, *Chislennost', razmeshchenie, vozrastnaya struktura, uroven' obrazovaniya, natsional'ny sostav, yazyki i istochniki sredstv sushchestvovaniya naseleniya SSSR*, Statistika, Moscow, 1971, p. 33.

[39] Godfrey Baldwin, *Projections of the Population of the USSR and Eight Subdivisions, by Age and Sex: 1973 to 2000*, p. 35.

[40] 5·5 × 41·2 + 0·5 × 55·8 + 0·5 × 3·0 yields 2·56 per cent, to which is added factor productivity growth of 0·5 per cent.

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Yet even that 0·5 per cent projected for factor productivity growth in 1981–85 could be too high. Some of the extraneous and domestic factors working against even this modest gain are:

(a) Most of the growth in increments to the labour force will take place in the non-Russian republics; in many of these, and especially in Central Asia, there has traditionally been resistance to migration to the cities and to the construction projects of the North.[41]

(b) By the mid-1980s, the USSR is expected to become a net importer of oil.

(c) Most of its hard-currency earnings will, it would seem, have to be earmarked for debt repayment and service plus oil imports from hard-currency suppliers, leaving little for the purchase of Western technology or grain.

(d) Large-scale cooperation or compensation ventures in Siberia may be hampered by the resistance of strongly conservative and nationalist elements in Moscow.

(e) Total indigenous energy supplies will taper off, with an anticipated growth of only about one per cent per annum in 1981–85, compared with 5·4 per cent in 1971–75 and 4·0 per cent in 1976–80[42]; overall economic growth is usually closely akin to overall energy consumption.

(f) The period 1961–74 is believed by some observers to have represented a period of exceptionally favourable climate over the Soviet grain belt. Conversely, a return of more "normal" climate in the 1980s would lead to a lowering of yields.[43]

(g) The coming decade will witness a decline in the growth of educational attainment.

(h) To maintain the Soviet armed forces at their current strength, by 1985 or so it would be necessary to recruit about 85 per cent of all 18-year olds. An increasing share of these will come from non-Russian nationalities.

(i) Will the defence lobby accept a slowdown in military expenditures in line with the decline in overall economic growth?

(j) Will the Soviet consumer tolerate a barely perceptible improvement in his still meagre living standards?

(k) Why should East European countries continue to supply most of their higher grade machinery, consumer durables and soft goods to the USSR when they cannot count on the Soviet oil and grain they need in repayment?

IN the present perspective, five principal courses of action offer themselves to the Soviet leadership:

(a) Do nothing very much—this is apparently the option chosen by the present incumbents.

[41] Murray Feshbach, *Prospects for Massive Out-Migration from Central Asia during the next Decade* (unpublished).

[42] CIA, *Soviet Economic Problems and Prospects*, Washington, Aug. 1977, p. 8.

[43] CIA, *USSR: The Impact of Recent Climate Change on Grain Production*, Washington, Oct. 1976.

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(b) Revert to the "Stalin model" of a high rate of growth of capital stock. This was ruled out as being politically inviable for anyone but Stalin and the provisions of the 10th five-year plan suggest that the planners have conceded as much.

(c) Rely increasingly on the massive infusion and successful diffusion of Western technology and equipment: this is evident at present, but how will the USSR pay for it in the 1980s?

(d) Reduce the burden of defence—no sign of this yet.

(e) Institute meaningful reforms of planning and management —don't hold your breath.

But other options may also be open.

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R & D: Planning and Financing[1]

Eugene Zaleski*

ONE can visualize at least three approaches to the study of planning and financing of research and development (R & D) in the Soviet Union. The first deals with the organization of R & D. The way in which R & D is organized affects its planning and administration differently at various levels. The process of planning, the means of financing, and the organizational structure of R & D all can combine to stimulate both research and the introduction of new techniques into the economy. Therefore, the first approach should focus on the R & D institutions and how they function.

A second approach involves an examination of policies for scientific and technical progress. These policies are clearly reflected in the Soviet effort to reorganize research institutes and the entire administrative apparatus of science. It is also necessary to study the priorities and options which determine the formulation of plans as well as the methods employed to carry them out.

Finally, it is also important to study science policy as an integral part of economic policies. R & D in this context becomes instrumental in economic growth. Thus the objectives of R & D are studied as part of the overall economic policy and while they strongly influence the direction of that policy, they in turn are affected by that policy. The ties between R & D and production, as they appear in the formulation and implementation of plans, also have particular importance.

It seems that the studies on planning and financing of R & D done to date fall mostly in the first category. This applies both to the study, *Science Policy in the USSR*, published by the Organization for Economic Cooperation and Development (OECD) in 1969, and to the excellent studies published in 1973 and 1976 by the Bureau of Economic Analysis, US Department of Commerce.[2] This limitation can best be explained by the type of data available on R & D: while information on organization, formulation of plans, and methods of financing of Soviet R & D in the USSR is relatively plentiful and accessible, precise data on the content of plans and budgets are extremely rare.

* This paper was translated from French by Prof. Huve of The George Washington University.

[1] I want to particularly thank Mr Louvan E. Nolting of the Bureau of Economic Analysis, US Department of Commerce, for his critique and contributions.

[2] E. Zaleski et. al., *La politique de la science en URSS, O.C.D.E.*, Paris, 1969; Louvan E. Nolting, *Sources of Financing the Stages of the Research, Development and Innovation Cycle in the USSR*, US Department of Commerce, September 1973; Louvan E. Nolting, *The Financing of Research, Development and Innovation in the USSR, by Type of Performer*, US Department of Commerce, April 1976; Louvan E. Nolting, *The 1968 Reform of Scientific Research, Development and Innovation in the USSR*, US Department of Commerce, September 1976.

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Management of Research and Development at the Central Level

There is no evidence that the distribution of power among the central agencies concerned with Soviet R & D has changed significantly during the last 10 years. The management of R & D is still divided among three "systems": the ministries, the Academy of Sciences, and the higher educational institutions. These are supervised from the centre and coordinated for the USSR Council of Ministers by three principal agencies: the State Committee for Science and Technology (SCST), the State Committee for Planning (*Gosplan*), and the USSR Academy of Sciences.

The formal aspects of the decision-making process are fairly well-known. A perspective plan (for 10 to 15 years) covering science and technology is developed by the SCST in conjunction with Gosplan, the Academy of Sciences, and the State Committee on Construction (Grosstroi).[3] The Central Ministries which are affected by the plan collaborate in the development of the plan. Plans which involve only separate industrial branches or Republics are developed by the appropriate ministries or the Councils of Ministers of the Republics. This long-range approach to planning permits the elaboration of 10- to 15-year projects for the design and building of enterprises and future models of machinery and equipment.

Based on this long-range plan, SCST, Gosplan and the Academy of Sciences determine the "principal directions" of science and technology for each five-year plan and list in the plan the "principal problems," which usually involve several branches. The development of a plan concerned with these "problems" is entrusted to the appropriate ministries. In the case of "interbranch" projects, the SCST appoints a "head" ministry to develop the necessary plans. Each plan must anticipate the financial and material resources necessary for its implementation.[4]

The general projections in a five-year plan affecting several branches are detailed in "Coordination Plans" (*koordinatsionnye plany*) and approved by the SCST. These plans outline the complete spectrum of research work, and include design and testing of new technology necessary for its introduction into production. The plans also specify the necessary manpower selected, independent of their administrative affiliations. The principal ministry also estimates the necessary funding and the costs for the entire coordination plan.

The forecasts in the five-year plan covering either a single ministry or one of the Republics and developed by the appropriate R & D

[3] Decree of the Central Committee of the Communist Party of the USSR and of the Council of Ministers of the USSR of 2 Sept. 1968; quoted by V. A. Rassudovskii, *Gosudarstvennaya organizatsiya nauki v SSSR* (State organization of sciences in the USSR), Moscow, 1971, pp. 56–57.

[4] *Metodicheskie ukazaniya k razrabotke gosudarstvennykh planov razvitiya narodnogo khozyaistva SSSR* (Methodological Instructions for the Elaboration of State Plans for the Development of the National Economy of the USSR), Moscow, 1974, p. 11.

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organizations are approved by the Ministries and the Council of Ministers of the relevant Republics.[5]

The eighth five-year plan (1966–70) listed 246 Coordination Plans and covered 3,000 projects, as foreseen by those responsible for implementation. These projects represented 40 per cent of the total budget for science earmarked for that five-year plan.[6]

During the current (10th) five-year plan (1976–80), the coordination plans were replaced by "scientific and technical programmes" (*nauchno-tekhnicheskie programmy*). The latter number approximately 200 and have also been approved by the SCST.[7]

It is difficult to estimate the actual importance and the implications of the replacement of the "coordination plans" with the "scientific and technical programmes." The official Soviet position indicates that the "scientific and technical programmes" are oriented towards the practical achievement of end results from science and technology. It is expected that in the course of the 10th five-year plan "more than half of the machinery, equipment, and instruments invented and improved within the framework of these programmes will be turned over for production."[8] The 10th five-year plan also stresses the complex character of technical development and calls for improvement in overall production by avoiding situations in which production which has priority is achieved by use of advanced technologies while other production remains dependent on the use of frequently inefficient manual labour.[9]

The tangible modifications described above require the participation in the development of new "programmes" not only of the technical departments of the ministries, but also of the Main Administrations supervising the production processes (*proizvodstvennye glavki*), and of other departments concerned with investments, and material and technical supply. The various stages of research work and delivery of results are also projected. In addition, tables which present the criteria for judging technical qualities have been worked out. These tables can be used to compare new products with the best domestic and foreign technologies and for setting price ceilings.[10]

Above all the aim of replacing "coordination plans" with "scientific and technical programmes" seems to be to facilitate more effective coordination of R & D plans with investment plans and with the allocation of material and technical resources. Another objective seems

[5] Ibid. pp. 12–13.

[6] Louvan E. Nolting, *The 1968 Reform of Scientific Research, Development and Innovation in the USSR*, op. cit. p. 11.

[7] V. Puzanov and V. Disson, "Kompleksnye nauchno-tekhnicheskie programmy" (Complex Scientific and Technical Programs), *Ekonomicheskaya gazeta*, No. 35, Aug. 1976, p. 8.

[8] *Ibid.*, p. 8.

[9] M. Vilenskii, "Tekhnicheskii progress v desyatoi pyatiletke" (Technical progress during the 10th five-year plan), *Voprosy ekonimi*, No. 11, 1976, p. 47.

[10] V. Puzanov and V. Disson, op. cit. p. 8.

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to be to reinforce control over priority projects. This was achieved by reducing the number of projects from approximately 250 to 200. Although the stress on introduction of R & D results into production is clear, this stress does not truly differentiate the " coordination plans " from the " programmes." Rather, the change involves primarily more detailed control.

While the procedural aspects of decision-making at the central level are fairly well known, the actual content is in the main unknown. Several questions need to be answered: what are the criteria used by major institutions to make choices? How are the priorities in the selection and retention of programmes determined? How do the head (*golovnye*) ministries justify their projects? If the programmes are of unequal importance and if about 20 of them take up more than half of the total budget, how do the supreme organs of the Government and Party rank the programmes?

It seems that a purely technical study describing the current system of regulations governing the organization and functions of Soviet R & D cannot answer these questions. Each " scientific and technical programme " is subject to " outside " influences and pressures, which give rise to conflicts which must be considered. Only specialized, monographic studies by branch or by group of projects could give us a better understanding of this subject.

Reforms of Management of Research and Development at the Branch Level

The decree of 24 September 1968 endeavoured to stimulate innovation by creating " optimum ties " between research institutes [11] and production units. The development of " complex " research institutes was encouraged by grouping within the ministries. Each complex institute was made responsible for improving the technology of a sector of the ministry's production. " Scientific-Production Associations " (*Nauchno-proizvodstvennye ob"edineniya* or NPO) were also established; these represented a combination of different research institutes and production units and were generally directed by a research institute.[12]

Innovation was also encouraged by the removal of administrative barriers, not only among the various research institutes, but also at different stages of the R & D process.[13]

[11] *Nauchnaya organizatsiya.* This term includes: industry (branch) research institutes, design bureaus, technological institutes, institutes and laboratories of the Academy of Sciences, independent experimental enterprises, and scientific institutes and laboratories of higher educational institutions.

[12] More than 100 Scientific-Production Associations have been created up to February 1976. Interview with A. V. Bachurin, Vice President of *Gosplan*, published in *Ekonomicheskaya gazeta*, No. 9, Feb. 1976, p. 21.

[13] The Scientific-Production Associations are engaged more in the innovation process than the " complex " research institutions because the former include research institutes,

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The most important measures taken since 1968 to encourage innovation are the subordination of most research organizations to production units. These mergers were carried out by forming production associations (*proizvodstvennye ob"edineniya*), to which were subordinated research organizations formerly directly subordinate to the ministry. The number of production associations has grown from 510 in July 1969,[14] to 1,715 on 1 January 1975,[15] to 2,300 on 1 January 1976,[16] and to more than 3,000 at the end of 1976.[17] A production association is characterized by the fact that its component production units do not share in the prerogatives set forth in the Regulation of the State Socialist Production Enterprise of 4 October 1965.[18]

Attempts to introduce economic accountability (*khozraschet*) at the branch level resulted in the decree of 2 March 1973. This decree provides for the abolition of main administrations of ministries (*Glavki*), to be replaced either by production associations or by industrial associations (*promyshlennye ob"edineniya*). The latter function on the basis of *khozraschet*, but the production associations, the NPOs, or the enterprises which belong to them retain separate legal identity and accountability; also, they function according to the Regulation of the State Socialist Production Enterprise of 4 October 1965.[19]

The administrative structure governing research institutes and NPOs is illustrated in Diagram 1. The table reveals that these organizations are placed at different levels of administration: while some of them are accountable directly to a ministry, others fit into the administrative hierarchy at a lower level.

There is some evidence that research institutes are currently subject to tighter controls by the agencies to which they are accountable. A recent statement on this subject by the chairman of Gosplan, N. R.

experimental enterprises and production establishments where new techniques, products and materials can be sufficiently tested and prepared before their use in other enterprises. Louvan E. Nolting, *The 1968 Reform*, op. cit., p. 15.

[14] Louvan E. Nolting, *The 1968 Reform*, op. cit. p. 19.

[15] " Production Associations and Scientific-Production Associations," *Narodnoe khozyaistvo SSSR v 1974 godu* (The National Economy of the USSR in 1974), Moscow, 1975, p. 167. Louvan E. Nolting uses the same results.

[16] Louvan E. Nolting, *The 1968 Reform*, op. cit. p. 9.

[17] These 3,000 Production Unions provide approximately 40 per cent of total industrial production. A. V. Bachurin's comments at the conference of 13–15 Dec. 1976 in Moscow, *Ekonomicheskaya gazeta*, No. 2, Jan. 1977, p. 11.

[18] V. Laptev, " Pravovoe polozhenie ob"edinenii " (Legal regulations for Associations), *Planovoe khozyaistvo*, No. 6, June 1973, p. 90.

[19] According to the decree of 2 Mar. 1973, industrial associations (at the Union or Republic level) constitute a unique productive and economic complex. They include industrial enterprises, research organizations, design bureaus, technological organizations (*Konstruktorskikh, Proektno-konstruktorskikh, tekhnologicheskikh organizatsii*), and other enterprises and organizations. Production Associations can belong to industrial associations. V. Laptev, op cit. p. 90; see also Louvan E. Nolting, *The 1968 Reform*, op. cit. p. 18. Louvan E. Nolting discusses the delays connected with the demise of *glavki* due to the resistance and temporizing of the ministerial apparatus, op. cit. note 56, p. 45.

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Baibakov, confirms the increased authority of the central organizations over research institutes.[20] The administrative reorganizations do not seem to have put those financial resources previously managed by the main administration (*Glavki*) of the ministries under the administrative control of the research institutes.[21]

Criteria for Success

A major objective of Soviet planning has long been to increase the effectiveness of programmes and of funds devoted to R & D. But the effectiveness of R & D is not easily determined and the problem of measuring its output remains unsolved. The recent Soviet manual, *Methodological Instructions for the Development of National Economic Plans*, calls for a correct assessment of the economic effects of programmes listed in the national plans.[22] For the first time, a special chapter on the five-year plan was devoted to planning of science and technology. The chapter includes a section on " the planning of the principal indicators of the technical-economic level of production " and varying criteria on physical quantities and value.[23]

But instead of recommending a new methodology for the evaluation of the economic effects of R & D results and of new technical processes, the *Methodological Instructions* provides for the application of the " Methodology for the Evaluation of Economic Effectiveness of Investments " approved by Gosplan, Gosstroi and the Presidium of the Academy of Sciences on 8 September 1969.[24]

The economic impact of R & D can be assessed both at the national level and at the sub-national level using one or more of the types of data analysis available in connexion with individual enterprises, branches, or other activities.

Interesting figures on the aggregate effectiveness of domestic expenditures for science (research and development) are cited by T. Khachaturov, who quotes from the work of the Research Institute for Employment.[25] According to these calculations, 70 per cent of the increase in productivity of industrial labour is due to growth in technical improvement

[20] " In the acceleration of technical progress, a greater role must be played by the SCST, The Academy of Sciences and the republics, as well as by research institutes of the ministries and institutions." Speech on the five-year plan, 1976–80 of N. K. Baibakov, *Ekonomicheskaya gazeta*, No. 45, Nov. 1976, p. 5.

[21] According to G. Mergelov, " Tsentralizovannye fondy i reservy vsesoyuznykh promyshlennykh ob"edinenii " (Centralized Funds and Reserves of All-Union Industrial Associations), *Planovoe khozyaistvo*, No. 8, 1976, p. 93. The New Scientific Research Funds created in the service of these institutes have not brought about great changes in planning and financing because the same resources were previously allocated by the ministry to the *Glavki* on a regular basis rather than by setting up special funds.

[22] *Metodicheskie ukazaniya*, op. cit. p. 10.

[23] Ibid. pp. 25–26.

[24] Ibid. p. 10.

[25] T. Khachaturov, " Kriterii i pokazateli effektivnosti nauchno-issledovatel'skikh rabot " (Criteria and Indices of the Efficacy of Research Work), *Voprosy ekonomiki*, No. 11, 1976, pp. 133–34.

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in the production process. The results of scientific research represent about one third of this increase. Productivity of labour would thus depend, at a 23–25 per cent rate, on introducing research results into the production process. Using this percentage and data on national revenue and expenditures for science, Khachaturov calculates the yield of expenditures for science to be 0·345. This signifies that the delay in recovery of investments in science in the USSR is about three years.[26]

Khachaturov emphasizes the approximate nature of these data: they are only applicable to retrospective aggregate and not branch expenditures, because increases in national revenue are not calculated by branch. He also stresses that the aggregate data cannot be evaluated on a long range basis because it is impossible to determine growth factors.

Disaggregated estimates involving particular programmes or groups of activities which focus on the economic effects of R & D have been calculated for a long time in the USSR. Several methods of calculation have been proposed, but none has received broad acceptance.[27]

Disaggregated calculations of the effectiveness of fundamental research are practically impossible, according to T. Khachaturov. It is particularly difficult to measure the effectiveness of research in mathematics, chemistry, biology and the social sciences. Then, too, the economic effects of discoveries in areas such as astro-physics cannot be evaluated at all because one can not determine the practical potential of these findings.[28]

Faced with the foregoing difficulties in collecting and analysing data,

[26] T. Khachaturov, op. cit. p. 136. These calculations pertain to the period from 1973 to 1975. The average increase in acknowledged national revenue is 14 billion rubles, of which 80 per cent or 11 billion are due to the growth in labour productivity. 25 per cent of this sum, or 2·9 billion, are due to the use of research results, as opposed to 7 billion average expenditures for research or 1·4 billion average expenditures for investment in science.

[27] *Osnovnye metodicheskie polozheniya po opredeleniyu ekonomicheskoi effektivnosti nauchno-issledovatel'skikh rabot* (Principal Methodological Indicators for Determining the Economic Efficacy of Research), Moscow, 1964, cited by T. S. Khachaturov, *Sovetskaya ekonomika na sovremennom etape* (The Current Stage of the Soviet Economy), Moscow, 1975, p. 152.

Metodika opredeleniya ekonomicheskoi effektivnosti novoi tekhniki (Method for Determining the Economic Efficacy of New Technology), Moscow, 1973, p. 36, cited by E. L. Gavrilov, *Ekonomika i effektivnost, nauchno-tekhnicheskogo progressa* (Economy and Effectiveness of Scientific and Technical Progress), Minsk, 1975, p. 313.

Metodika opredeleniya narodno-khozyaistvennogo ekonomicheskogo effekta poluchaemogo v rezultate vnedreniya novoi tekhniki (Method for Assessing the National Economic Effects of the Introduction of New Technology), AN SSSR TsEMI, Moscow, 1973, p. 46, cited by E. I. Gavrilov, op. cit. p. 313.

Poryadok otsenki deyatel'nosti nauchno-tekhnicheskikh i proektnykh organizatsii (Method for Evaluating the Activity of Research Organizations and Bureaux of Studies) (approved by the SCST and State Committee of Inventions), cited by K. Efimov, L. Maksimov and F. Amirdzanyan, " Sovershenstvovanie planirovaniya i upravleniya nauchno-tekhnicheskikh progressom " (Improvement of Planning and Management of Scientific and Technical Progress), *Planovoe khozyaistvo*, No. 11, 1974, p. 18.

Metodika programmnogo prognozirovanya nauki i tekhniki (Method of Programme Forecasting in Science and Technology); developed by the Academy of Sciences of the Ukraine and approved by the SCST as a basis for forecasting and cited by G. Dobrov in *Voprosy ekonomiki*, No. 11, 1976, p. 127.

[28] T. Khachaturov, op. cit. p. 135.

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other more practical methods for gauging the quality of R & D were developed. These methods include examining delays in the implementation of plans, and counting the number of inventions, publications and theses which are defended.[29]

In applied research [30] the criterion first used to measure its effectiveness concerns the implementation of the plan. According to official data, 97 to 98 per cent of funds earmarked for scientific research were expended.[31] On the other hand, it has been admitted that between 1971 and the first six months of 1974, the state plans for science and technology were not fulfilled.[32] The arbitrary nature of these assessments is frequently stressed in the USSR. Thus, V. N. Arkhangel'skii, in an editorial in *Planovoe khozyaistvo*, has noted that the term "implementation," as used in this area, has a completely relative meaning.[33] In the same editorial he states that not all programmes involving the assimilation of new products and technological processes are included in the plans.[34] And E. I. Gavrilov points out that the plans of the research institutes and the design bureaux are not always sufficiently justified and often include projects which are obsolete. Since it is impossible to evaluate properly the extent of the implementation of plans qualitative judgments about success in such implementation cannot in fact be made.[35]

T. Khachaturov also points out the necessity of distributing the aggregate economic results among the different stages of the research and production cycle. Such a task presents additional difficulties.[36] According to Khachaturov, it is also advisable to keep in mind the relative efficacy of different projects, as practised in calculating the effectiveness of investment. The rate of return should not exceed that used for investment (12 per cent) nor the discount rate corresponding to the interest rate for long-term credit (8 per cent), in order not to impede scientific and technical progress.[37] Other criticisms regarding the evaluation of economic effects of R & D focus on the need to eliminate distortion due to the fluctuations in prices and wages.[38] Furthermore, economists like A. S. Bystrov propose that expenditure for the protection of the environment

[29] E. Zaleski, et al., *Science Policy in the U.S.S.R.*, OECD, Paris, 1969, p. 43.

[30] T. Khachaturov, op. cit. p. 137, defines applied research as work whose objective is to introduce any research results directly into production.

[31] V. N. Arkhangel'skii, "Ob ekonomicheskikh metodakh upravleniya nauchno-tekhnicheskim progressom" (On Economic Methods for Managing Scientific and Technical Progress), *Izvestiya Akademii nauk SSSR, Seriya ekonomicheskaya*, No. 3, May–June 1976, p. 68.

[32] "Nauchno-tekhnicheskii progress i effektivnoe razvitie narodnogo khozyaistva" (Scientific and Technical Progress and the Efficient Development of the National Economy), *Planovoe khozyaistvo*, No. 11, 1974, p. 7.

[33] V. N. Arkhangels'skii, op. cit. p. 68.

[34] *Planovoe khozyaistvo*, editorial cited, No. 11, 1974, p. 7.

[35] E. I. Gavrilov, op. cit. p. 220.

[36] T. Khachaturov, op. cit. p. 138.

[37] Ibid. pp. 138–40.

[38] M. Maksimova, "Sotsialno-ekonomicheskaya effektivnost' nauchno-tekhnicheskogo progressa" (Social and Economic Efficacy of Scientific and Technical Progress), proceedings of a symposium in Sofia, in *Planovoe khozyaistvo*, No. 10, 1976, pp. 144–45.

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should be included in the national budget, and that the all-inclusive character and the social utility of environmental protection be recognized.[39]

It is interesting to note the current effort in the Soviet Union to reinstate the purely economic calculations of R & D results. Also, M. A. Vilenskii suggests that the utilization of new technical processes should not only increase production and reduce expenditures, but should also increase the capabilities of workers at their level of culture and education and ameliorate working conditions. Therefore, the results of R & D should not be measured directly, but indirectly.[40]

In discussing the purely economic results of R & D, E. I. Gavrilov is often concerned with research based on known cumulative results. Gavrilov proposes an approach based on a system of criteria (*systemnyi podkhod*). This approach is receptive to technical, techno-economic, statistical and other indicators. He suggests a system of weights (*ball'naya otsenka*), whose number when divided by 100,000 rubles of annual expenditures would allow the specific contribution of a research institute to be estimated.[41]

E. I. Gavrilov points out an interesting relationship between the economic system and research results:

> As a general rule new scientific and technical solutions are effective in the long run. Without a fundamental reorganization of the production process, it is not possible to realize the potential advantages inherent in new technological processes. Thus, the development and introduction of essentially modern techniques exposes many contradictions (*nesootvetstvii*) within the traditional production process currently used; this proves to be less efficient than the development and introduction of slightly less modern techniques.
>
> In the well-established conservative structure of the production system, the tendency towards slow and "evolutionary" (*evolutsionnye*) changes in techniques and technology dominates. This is aimed at achieving stability. Because of this tendency, it is important not to adjust scientific and technical solutions to the actual productive system but, on the contrary, to resist the immediate needs for accelerated growth, i.e. to follow the logic of fundamental change. This again exposes profound (*podlinnye*) scientific problems and calls for fundamentally new scientific and technical solutions.[42]

The System of Incentives

Important changes in the system of material incentives for workers in research institutes were introduced by the 1968 decree of the Party's

[39] A. S. Bystrov, in "Sotsialno-ekonomicheskaya effektivnost' nauchnogo progressa", op. cit. *Planovoe khozyaistvo*, No. 10, 1976, pp. 145–46.

[40] M. A. Vilenskii, "Sotsialno-ekonomicheskaya effektivnost' nauchnogo progressa," op. cit. *Planovoe khozyaistvo*, No. 10, 1976, p. 145.

[41] E. I. Gavrilov, op. cit. pp. 230–31.

[42] E. I. Gavrilov, op. cit. pp. 234–35.

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Central Committee and the Council of Ministers.[43] The decree changes the source for funding incentives. Under the old method, funding for rewards was based on the cost of work done. This was tantamount to making it dependent on the number of projects completed. By contrast, funding of incentives under the new method is determined by the return that R & D results yield to the consumer and to the economy.[44]

The September 1968 reform allocated to research organizations funds analogous to those that had been given to enterprises by the reforms of October 1965 and March 1973, when funds were introduced to stimulate R & D in the ministries and in the industrial associations.[45] Three incentive funds were established by the 1968 decree[46]:

Fund for Material Incentives—for bonuses to workers according to the annual results achieved by their institutes and for individual achievements.

Fund for Social and Cultural Measures and Housing—for construction and repair of housing, for financing of cultural organizations and services, and for improvement in services furnished to workers.[47]

Fund for Development of the Research Organization—for additional investments for equipment, instruments, and materials relevant to research, and for programmes encouraging technical achievements and improving the quality of research.

The three funds are ultimately to be placed under the direction of each research organization. Credits not used during a current year are carried over to the following year.

The Fund for Material Incentives and the Fund for Social and Cultural Measures and Housing are supplied from the following sources[48]:

Profits generated by lower costs due to the introduction of new technology.

[43] *O meropriyatiyakh po povysheniyu effektivnosti raboty nauchnykh organizatsii i uskoreniyu ispol'zovaniya v narodnom khozyaistve dostizhenii nauki i tekhniki* (On Measures Concerning the Growth of Work Efficacy of Scientific Organizations and on the Acceleration of Utilization of Scientific and Technical Achievements in the National Economy), *Spravochnik partiinogo rabotnika* (Party Worker's Handbook), Issue 9, Moscow, 1969, pp. 257–85.

[44] Louvan E. Nolting, *The 1968 Reforms*, op. cit. p. 25.

[45] The same funds were also established in the Scientific-Production Associations and the Institutes for complex research by the same decree. See *O meropriyatiyakh*, op. cit. pp. 270–71 and further pp. 7–8.

[46] *O meropriyatiyakh*, op. cit. pp. 279–80.

[47] The Fund for Social and Cultural Measures and Housing functioned initially only in research institutes and enterprises which are part of the Ministry of Electro-technical Industry; it was introduced in other ministries only after November 1970. Louvan E. Nolting, *The 1968 Reform*, op. cit. p. 25.

[48] 50–60 per cent of the funds are deposited into the Material Incentive Fund and 40–50 per cent into the Fund for Social and Cultural Measures and Housing, *O meropriyatiyakh*, op. cit. pp. 279–80.

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Profits anticipated from sales of new products, calculated as the annual economic effect of their application on a national scale.

Costs of prototypes of special equipment and of systems based on world-wide advanced technology, and whose economic effects cannot be determined at the national level.

80 per cent of the funds thus obtained remains at the disposal of the research institute while 20 per cent is transferred to central funds for bonuses within the ministries.[49]

The Fund for the Development of the Research Organization is made up from the following sources:

1·5 per cent of the annual economic effect on a national scale guaranteed by the research organization; this sum cannot exceed 6 per cent of the estimated cost of the work and is authorized only if the estimated cost does not exceed 50 per cent of the value of the economic effect projected by the research organization.

75 per cent of the profits obtained by the research institutes.

Returns from sales of licences at home and abroad and proceeds from the sale of unused equipment.[50]

When new products do not meet the standards of foreign technology, deposits into the incentive funds are not made, unless the reason is beyond the institute's control. Even when the institute is proved to be blameless, the amount of deposits is reduced by 50 per cent.[51] Research institutes which were not transferred to the new incentives system introduced in September 1968 continue to function according to the old system of incentives, which is based on cost and on the salary fund.[52]

Further and more specific directions concerning the incentive funds accompanied the recently announced regulations on "the Establishment and Utilization of Funds for Economic Stimulation of the Scientific-Production Associations."[53] The first guidelines concerned the sources of financing the Fund for Material Incentives and the Fund for Social and Cultural Measures and Housing. The following sources were added:

Up to 20 per cent of the wage funds for workers who participate directly in projects concerning environment protection and technical safety, the economic effect of which cannot be directly estimated.

[49] *O meropriyatiyakh*, op. cit. p. 280.
[50] Ibid. p. 280.
[51] Ibid. p. 276.
[52] *O meropriyatiyakh*, p. 280. See also Louvan E. Nolting, *The 1968 Reform*, op. cit. p. 26.
[53] "Polozhenie o poryadke obrazovaniya i ispol'zovaniya fondov ekonomicheskogo stimulirovaniya nauchno-proizvodstvennykh ob"edinenii," approved by Goskomtrud USSR and the SCST in agreement with the All-Union Central Trade Unions, *Ekonomicheskaya gazeta*, No. 26, Sept. 1976, pp. 15–16.

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Profits resulting from the sale of equipment.
Amounts from appropriate reserves of the Ministry.
Rewards received from open competition.
Appropriations from centralized funds for the development of new technology. Remuneration for delivery of technical documentation.

The second guideline pertained to the distribution of funds. Thus the distribution between the Fund for Material Incentives and the Fund for Social and Cultural Measures and Housing is normally to be carried out at a ratio of 60:40. However, the directors of Associations can make equal distributions under certain conditions.

To the sources which supply the Fund for Development of the Research Organization, two additional ones are added:

Depreciation charges for complete renewal of fixed funds.
Profits obtained from sales of products of the Association.

The incentive funds can be neither deducted beforehand nor subjected to an equal distribution between different Associations, except for cases determined by the Council of Ministers of the USSR.

The paying of rewards to workers in research organizations was recently standardized by a new regulation.[54] The regulation stresses that premiums paid to workers who have taken a direct part in work are to be in proportion to the economic effects of any new work. Also these premiums are to be paid regardless of other incentive systems in force. There are two categories of premiums:

For the development and introduction of new techniques.
For results from scientific and production activities.

Funding made for the first category of premiums is conditioned by fulfilment of work schedules outlined in the scientific-technical plan of the Association.[55] The premiums are paid after all the work is completed. The total amount of the premium is fixed by the director of the Association with the agreement of the Trade Union Committee. The staff members of an institute are paid when the total cycle of work has been completed, i.e. from research to production; other workers receive bonuses after completion of specific projects. Thus, premiums contained in the Fund for Results from Scientific and Production Activities are paid, according to differentiated criteria, to senior staff members,[56] engineers, technicians, and other employees.

[54] "Tipovoe polozhenie o premirovanii rabotnikov nauchno-proizvodstvennykh ob"edinenii" (Model Regulation on Payment of Premiums to Workers in Scientific-Production Associations), *Ekonomicheskaya gazeta*, No. 48, Nov. 1976, p. 16, and No. 49, Dec. 1976, p. 14 (approved by the Goskomtrud and the Presidium of the Central Committee of Trade Unions with the agreement of the SCST and the Minister of Finances).

[55] In this schedule are included: development of scientific projects (*zadel*), scientific instructions and technical-economic research provided for in the national plan.

[56] Overall director, chief economist, head of the economic sector and of the plan, chief accountant and principal accountants associated with the chief, head of the section for technical quality control.

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Senior staff members are paid for the realization of major specifications—R & D, transfer of technical documentation, design and testing of prototypes, etc. Rewards depend on achievement of the major specifications, in particular attainment of planned production goals for principal products together with export goals and other supplementary specifications, all of which are determined by the superior state agency.

Premiums for engineers, technicians and employees are set by the director of the Association.

Premiums paid to works are taken from both the incentive fund and the wage fund. Workers are paid after achieving goals in the introduction and assimilation of new technology, and after they meet and surpass production goals. High quality performance, realization of work standards and cost reduction realized in relation to the plan are additional criteria.

The regulation concerning bonuses for workers in the Scientific Production Associations (NPOs) makes provision for the suspension of payments for numerous reasons, e.g. professional errors, bad conduct, absenteeism, failure to execute contracts, failure to execute plans for innovation, errors in accounting, unjustified over-estimating in proposals on price setting, etc.

The 2 March 1973 decree of the Council of Ministers of the USSR created industrial associations [57] and established central funds for them. These funds correspond to the incentive funds which exist for research organizations and for the Scientific-Production Associations, (NPOs), viz. the Centralized Fund for the Development of Production, the Centralized Fund for Material Incentives, and the Centralized Fund for Social and Cultural Measures and Housing. The incentive funds in the industrial associations are generated by deducting up to 10 per cent from the incentive funds of subordinate enterprises and by deductions of 10 per cent of the total from the central incentive fund.[58] This way an equal distribution at the branch level is achieved.

The 1968 decree also modifies the fund set up for stimulating the creation and introduction of new technology.[59] The " Unified Incentive Fund of the Ministries," formed by deductions of 20 per cent,[60] advances funds to research organizations to develop new techniques which are estimated to require more than two years. The advance is repaid after the new techniques are in use.[61] In addition, funds are advanced for important projects or for those capable of bringing

[57] For the position of these industrial unions in the administrative hierarchy, see Figure 1.

[58] G. Mergelov, " Tsentralizovannye fondy i rezervy vsesoyuznykh promyshlennykh ob"edinenii " (Centralized Funds of Federal Industrial Unions), *Planovoe khozyaistvo*, No. 8, Aug. 1975, pp. 87–92.

[59] For more details see: R. Amann, M. J. Berry, R. W. Davies, " Science and Industry in the USSR." in *Science Policy in the USSR*, OECD, Paris, 1969, pp. 496–99.

[60] Ibid. pp. 18–19.

[61] *O meropriyatiyakh*, op. cit. p. 280.

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about particularly high economic benefits.[62] In those ministries which do not have a Unified Incentive Fund, the funds for stimulating the creation and introduction of new technology are derived according to the specifications of the decree of 25 August 1964, providing for deductions of 50 per cent to 75 per cent from the incentive funds in enterprises and research organizations for the benefit of the central fund of the Ministry [63] (or of the *Sovnarkhozy* before their abolishment in 1965).

Financing of Research and Development

One can distinguish three major categories of expenditures for R & D in the USSR:

1. Budgetary expenditures.
2. Expenditures of economic and research organizations which are included in the official evaluation.
3. Expenditures of economic and research organizations which are not included in the official evaluation.

Soviet statistics published on this subject are presented in Table 1. Such data are extremely scanty. They concern mainly the sources of financing R & D presented in an aggregated form. Furthermore, nothing is published on the distribution of funds by branches of the economy nor by most important projects. A thorough study of this problem would reveal whether it is possible to estimate these expenditures. In the meantime, we can only comment on the major thrust of these expenditures and on the evolution of the primary mechanisms of financing.

The first observation that can be made from the data presented in Table 1 concerns the proportion of budgetary and extra-budgetary expenditures for science. With the transfer of research institutes to *khozraschet*, the creation of NPOs, the attachment of research institutes to Associations, and the establishment in the ministries of new funds for the development of science and technology, the emphasis on " self-financing " is quite evident. It is therefore not surprising that budgetary expenditures as a percentage of the total official expenditures for science were reduced from 59·2 per cent in 1960 to 47·9 per cent in 1974 (calculated from Table 1).

Another phenomenon is the slower increase of expenditures for investments in science in comparison with current outlays: from 1960 to 1974 investment expenditures increased by 166·7 per cent while current expenditures for science grew by 351·5 per cent (calculated from Table 1).

The budget of the Academy of Sciences increased more rapidly than total expenditures (see note 11 of Table 1), but it is difficult to

[62] Louvan E. Nolting, *The 1968 Reform*, op. cit. p. 26.
[63] Ibid.

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TABLE 1

Distribution of Expenditures in Science in the USSR (in billions of rubles)

	1960	*1965*	*1970*	*1973*	*1974*	*1975*
Official Expenditures:						
Total	3·9 [a]	6·9 [a]	11·7 [b]	15·7 [b]	16·5 [b]	17·5 [c]
Includes:						
Current expenditures	3·3 [d]	5·8 [d]	10·4 [d]	—	14·9 [e]	—
Investments	0·6 [d]	1·1 [d]	1·3 [d]	—	1·6 [e]	—
Budgetary Expenditures:						
Total	2·31 [q]	4·27 [q]	6·43 [g]	7·50 [g]	7·90 [g]	—
Includes:						
Academy of Sciences of the USSR and of the Republics; Specialized Academies (h)	—	—	—	—	1·03 [i]	—
Includes:						
Academy of Sciences of the USSR	0·16 [j]	0·15 [j]	—	—	—	— [k]
Expenditures not included in the official total (m):						
Enterprises	1·50 [m]	3·05 [n]	5·94 [n]	—	—	—
Cost of imported science	0·24 [p]	0·35 [p]	0·56 [p]			

[a] *Narodnoe Khozyaistvo SSSR v 1969 godu* (National Economy of the USSR in 1969), Moscow, 1970, p. 771.

[b] *Narodnoe Khozyaistvo SSSR v 1974 godu* (National Economy of the USSR in 1974), Moscow, 1975, p. 758.

[c] *SSSR v tsifrakh v 1975 godu* (The USSR in Figures in 1975), Moscow, 1976, p. 69.

[d] B. M. Grinchel, *Izmerenie effektivnosti nauchno-tekhnicheskogo progressa* (Measure of the Effectiveness of Scientific and Technical Progress), Moscow, 1974, p. 40, quoted by Louvan E. Nolting in *The Financing of Research, Development and Innovation in the USSR, by Type of Performer, Foreign Economic Reports,* No. 9, April 1976, U.S. Department of Commerce, Bureau of Economic Analysis, pp. 17–18. Louvan E. Nolting expresses doubts as to the exact character of the evaluations including and excluding investments. Let us note that the amount of investments in Science was calculated by me (E. Z.) by deducting from the total the current expenditures excluding the investments.

[e] Budgetary investments in education and science: 1,005 million rubles in 1965, 1,290 million in 1970 and 1,633 million in 1974: T Khachaturov, *Kriterii i pokazateli effektivnosti nauchno-issledovatel'skikh rabot, art. cit., Voprosy ekonomiki,* No. 11, 1976, p. 135 (Current expenditures estimated by subtraction from the total). Let us note that these figures come from estimates for 1965 and 1970 obtained with the aid of figures quoted by B. M. Grinchel and reproduced by Louvan E. Nolting.

[f] 4·126 million rubles according to *N.Kh.* 1974, p. 759. We are reproducing the old figure, slightly different, which is calculated according to the same principles as the figure cited for 1960.

[g] *N.Kh.* 1974, p. 759.

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draw conclusions about this disparity. It should not be forgotten that between 1960 and 1965, the budget of the Academy of Sciences remained stationary because of reorganizations. The current increases imply a certain revival in the importance of this institution (its past "setbacks" have always been only relative).

A general assessment of science expenditures is made difficult by the lack of precision concerning expenditures not included in the official total (see Table 1). Louvan E. Nolting lists the following categories for these expenditures [64]:

1. Research and development by research subdivisions of enterprises financed from costs.
2. Work carried out by scientific organizations of branches of industry and experimental plants related to the production and testing of prototypes.
3. Research and development financed from the Fund for the Assimilation of New Technology and the Development of Production.
4. Research and development directed towards the production of special order prototypes (financed by investment credits).
5. Research and development for construction (included in investment credits).
6. Research by the Ministry of Geology.
7. A portion of research and development of the institutes of higher education.
8. Part of research and development for military application.
9. Space research and development.

[h] T. Khachaturov (art. cit. p. 136) mentions the "Academies of the Branches" (*Otraslevye Akademii*). This concerns the academies directly subordinate to the Ministries, as the Lenin Academy of Agricultural Sciences, subordinate to the Ministry of Agriculture, the Academy of Medical Sciences, subordinate to the Ministry of Public Health, the Academy of Construction and Architecture, subordinate to the State Committee on Construction. On this subject see Helgard Wienert, "Organization and Planning of Research in the Academic System", in *Politics of Science in the USSR*, OECD, Paris, 1969, p. 253.

[i] Estimate: 13 per cent of budgetary expenditures for science. T. Khachaturov, art. cit., p. 136.

[j] E. Zaleski, "Centralized Planning of Research and Development in the Soviet Union", in *Politics of Science in the USSR*, OECD, Paris, 1969, p. 103.

[k] According to E. Sklyarov, Vice President of the State Committee for Science and Technology, "in the course of recent years" the budget of the Academy of Sciences has increased at greater rates than the budget of Science in general. Statements cited by Loren Graham, *The Place of the Academy of Sciences System in the Overall Organization of Soviet Science*. Report to the conference of the National Science Foundations, November 17–21, 1976 (Airlie House), p. 20.

[m] The list of these expenditures cited in the table given here is not exhaustive. On their contents, see the text of this report.

[n] Louvan E. Nolting, *The Financing of Research*, op. cit. pp. 41–42 (from Grinchel, op. cit.). Louvan E. Nolting indicates that this category includes also expenditures of research and development and for innovation. One cannot, therefore, add these expenditures to the total of expenditures allocated for science.

[p] B. M. Grinchel, op. cit., cited by Louvan E. Nolting, *The Financing of Research*, op. cit. p. 42.

[q] *N.Kh.* 1969, p. 772.

[64] Louvan E. Nolting, *The Financing of Research and Development*, op. cit. pp. 19–20.

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In the non-budgetary financing of R & D, the Unified Fund for the Development of Science and Methodology within the ministries plays an important role. The Unified Fund was established to encourage direct financing of R & D through the Ministry.

The first Unified Fund was created in the Ministry of the Electrotechnical Industry in 1969. This replaced three previous sources of funding [65]:

Budgetary allocations.
Deductions included in costs.
Resources from the Fund for the Assimilation of New Technology.

The Unified Fund is replenished with the profits derived from the technical innovations of branches and their economic activities. The prior deductions from profits for the Unified Fund were fixed for the period of 1969 to 1973 at 13 per cent of the annual profits planned in 1968 prices.[66]

In 1971 the Unified Fund was introduced into the Ministry of Precision Instruments and Means of Automation and in 1972 into the Ministries of the Chemical Industry and of Tractor and Agricultural Machine-Building.[67] The Unified Fund is used both to finance R & D and the assimilation and introduction of new technology; therefore, it absorbs allocations of formerly separate funds. The rate of deductions from profits derived from technical innovations varies with each ministry. In the Ministry of the Electrotechnical Industry, the Unified Fund constitutes the only central source for financing of R & D. Additional funding is derived directly from performing contract work. The role of the unified fund in relation to other sources of financing R & D in the ministries having a unified fund is shown in Table 2.

In the Ministries which do not have Unified Funds, there is a Fund for the Assimilation and Introduction of New Technology. It is established from prior deductions from costs, but support of R & D financing from this source does not exceed 10–15 per cent.[68] The establishment of a Unified Fund sometimes poses problems for the optimum distribution of resources between R & D and innovation. Certain authors call for the creation of two separate funds.[69] In any case industrial associations, which came into existence as a result of the decree of 2 March 1973, maintain separate funds, one for

[65] V. A. Prokopov, "Itogi raboty Minelektrotekhproma v novykh usloviyakh planirovaniya, finansirovaniya i stimulirovaniya novoi tekhniki" (Results of Work of the Ministry of Electrotechnical Industry Under New Conditions of Planning and Stimulation of New Technology), *Finansy SSSR*, No. 1, 1977, p. 22.

[66] V. A. Prokopov, op. cit. p. 22.

[67] Louvan E. Nolting, *The Financing of Research and Development*, op. cit. p. 26. Moreover, from one to three research institutes in each ministry were transferred to the *Unified Fund* system on an experimental basis.

[68] V. N. Arkhangel'skii, op. cit. p. 73.

[69] Ibid. p. 73.

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TABLE 2

Distribution of Sources of Financing Between the Unified Fund and the Other Sources and Contracts in 1972 (by percentage) [a]

	Unified Fund	*Contracts*	*Deducted Costs*	*Budget*
Ministry of the Electrotechnical Industry	49·0%	51·0%	0·0%	0·0%
Ministry of Transport, Heavy and Power Machinery	42·5%	57·4%	0·0%	0·1%
Ministry of Precision Instruments, Means of Automation, and Control Systems	34·3%	60·7%	5·0%	0·0%

[a] G. V. Bazarova, "Financing of Scientific Research in the Branches," in *Finansy i nauchno-tekhnicheskii progress (Finances and Scientific Progress)*. Editors V. U. Budavey and S. A. Sitaryan, Moscow, 1973, p. 139, quoted by Louvan E. Nolting, *The Financing of Research and Development*, op. cit.

TABLE 3

Fund for Assimilation, Fund for Development, and Unified Fund 1965-1976
(in millions of rubles) [a]

	Fund for Assimilation	*Fund for Development*	*Unified Fund (Ministry of the Electrotechnical Industry)*
1965	421·1	—	—
1968	940·2	1,644	—
1970	935·5	3,341	—
1971	1,259·6	3,724	—
1972	1,247·2	4,077	303·6
1973 Plan	—	—	271·8 [b]
1973	—	3,878	293·2
1974 Plan	—	—	299·2 [b]
1974	—	3,899 [c]	288·4
1976 Plan [d]	—	—	515·8 [d]

[a] Louvan E. Nolting, *The Financing of Research and Development*, op. cit. p. 36 except where indicated to the contrary.
[b] V. A. Prokopov, art. cit. p. 23.
[c] *N.Kh. 1974*, p. 753.
[d] Deductions from profits planned on 1968 prices and conditions. V. A. Prokopov, art. cit. p. 22.

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"scientific research" and another for "assimilation of new techniques." [70]

Table 3 describes the growth of the three major funds which are used in part to finance R & D.

TABLE 4

Evaluation of Expenditures for the Introduction of New Technology and of their Economic Effects

(millions of rubles, except where indicated to the contrary)[a]

	1965	*1970*	*1971*	*1972*	*1973*	*1974*	*1975*
Quantity of measures for new technology introduced (in thousands)	—	423	449	497	509	579	—
Effective expenditures for the introduction of measures (including expenditures for preceding years)	—	5,011	4,902	5,327	6,559	6,711	—
Number of jobs freed (by 1000)	—	399	447	482	553	588	—
Cost reduction or decline in production expenditures (annual)	—	1,971	2,089	2,218	2,466	2,596	—
Annual economic effect of the introduction of new technology	—	2,607	2,753	2,997	3,543	3,697	—
Annual savings from introduction of inventions and of proposals for production improvement	1,908	3,004	3,237	3,411	3,778	4,391	—

[a] *N.Kh.* 1974, p. 149, except where indicated to the contrary (a) *SSSR v tsifrakh v 1975 godu*, op cit., p. 72.

[70] G. Mergelov, op. cit. *Planovoye khozyaistvo*, No. 8, 1975, p. 93. The Fund for the Assimilation of New Techniques is established from prior deductions on the costs differentiated by industrial branches. In the machine-building industries, for example, the deduction is usually 3 per cent.

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Statistics for the assessment of the economic effects of R & D[71] are compiled with increasing frequency. This is due to the new emphasis placed on evaluation of economic effects in the Methodological Instructions for the Development of Planning (see above, p. 21ff.). Some data on this subject are shown in Table 4.

Because these data are of undoubted interest, a more extensive study analysing the data is necessary. This is not easy considering the lack of precision of available sources. Also, the implications of the economic effects of R & D are somewhat distorted by the defects of the Soviet pricing system, by the methodologies used for calculating cost, by the dissemination of results at the Ministry level, etc. One would also need to know in more detail the programmes selected and the proportional application of expenditure in the research-production cycle. This question must be examined in a broader scientific-technical context.

Policies of Scientific and Technical Progress in the USSR

One way to study R & D planning is by a thorough investigation of the approximately 200 scientific and technological programmes presented in the five-year plan. Seemingly, it should not be impossible to identify at least a part of the programmes and to determine those organizations responsible for their implementation. Also, it would be extremely useful to collect data concerning the dimensions of the projects and the means used to carry them out.

It would also be necessary to test the reliability of the long-range plan (15–20 years) for the development of science and technology. This plan is cited in several sources.[72] I have not been able to find its text in the sources so far consulted, but a certain " reconstitution " of this text, even a summary one, should be attempted.

The 200 programmes are selected, in principle, to meet the objectives of this long-term plan. First, they are formed into five-year plans, then into successive annual plans. The simplest method would then be to compare the objectives of the long-term, the five-year, and the annual plans while focusing on the continuity of policies and operating decisions. Research in this direction should produce findings of great interest.

Another approach, related indirectly to the study of Soviet science policy, is the development of certain priorities which could clarify governmental decisions.

These priorities can be gauged from the policies pertaining to scientific and technical personnel. While the available financial data are very broad and not detailed, statistics on the work force assigned to R & D are much more precise. The statistics usually pertain to personnel in the industrial sector and could be even more detailed.

[71] Ibid. p. 11.
[72] See *Metodicheskie ukazaniya*, op. cit. Moscow, 1974, p. 11.

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The placement of scientists with advanced degrees in different sectors constitutes another gauge and this is even more useful because data on scientific disciplines are collected with more precision. Finally, changes in employment of specialists and the attractive perquisites offered to them are valuable clues to policies pursued.

Other tendencies in science policy may be found in the dissemination of new technology and licences. But severe complications are involved in the development and analysis of such data:

Commercial secrecy prevails in the USSR just as it does in the West.

Useful methodologies are not available.
Statistics on foreign commerce are not precise.
Comparison of imported and domestic products is difficult.
Comparison of technological performance in the USSR and the West is difficult.[73]

Studies examining specific questions or aspects of Soviet science policy are also very important. Once done it would be necessary to relate these studies and their results to a broader understanding of all policies pertaining to scientific and technical progress in the USSR.

Technological Progress as an Instrument of Growth

One of the greatest difficulties in planning science in the USSR is to relate it to broader economic goals. The difficulties encountered in this area have been noted continuously.[74] Recently, the Soviet government made a special effort to solve this problem by devoting—for the first time—a special chapter in the national plans to the planning of science and technology.[75] The effort attempts to link R & D with production by prescribing in detail the transfer of new technology and research results to the production process. The chapter also ties together R & D and investment plans.

It should be noted that the method for actually relating R & D to investment plans, and subsequently to the production process, is only imperfectly known due to the unavailability of precise data on plans and results in this area.

To integrate plans for R & D with policies for economic growth, it is necessary to present these plans in terms of choices, viz. projects chosen and projects eliminated.[76] For example, the Soviet space programme competes with the civilian and military sectors for allocation of valuable resources. Thus it is expedient to focus on the real costs of each programme and on its direct and indirect benefits.

[73] See Amann's paper on the difficulties of such a comparison and the extent of the task associated with such a comparison.
[74] On this subject, see E. Zaleski, *Science Policy in the USSR*, OECD, 1969, pp. 73–96.
[75] *Metodicheskie ukazaniya*, op. cit. Moscow, 1974, pp. 9–11.
[76] See *Soviet Space Programmes, 1971–75*, Staff Report, Committee on Aeronautical and Space Sciences, United States Senate, Aug. 1976, Vol. I and II, Washington, DC, 1976.

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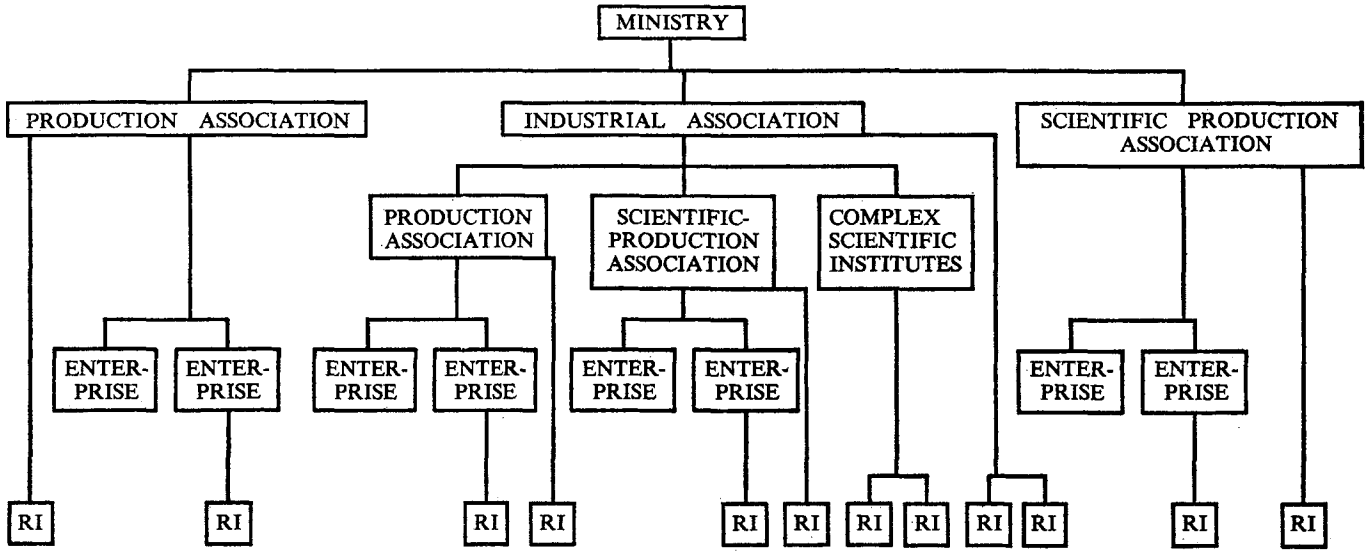
Diagram 1

Organization of the Management of Research Institutes Since the Creation of Scientific-Production Associations



Source: See text and *Rekomendatsii po sozdaniyu nauchno-proizvodstvennykh ob"edinenii* (recommendations concerning the constitution of Scientific-Production Associations), *Ekonomicheskaya gazeta*, No. 42 Oct. 1976, p. 16.

RI—Research Institute and/or Design Bureau.

(a)—on the possible direct subordination to the ministries, see recommendations, op. cit.; the proportion of Scientific-Production Associations directly subordinate to the Ministries is unknown.

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It should also be appropriate to examine the role of technology as a generator of future growth, keeping in mind that we anticipate a reduction in the growth of manpower in the Soviet Union in 1981–90.[77] Can technical progress offset the declining yield of invested capital observed during the last few years?

It is particularly difficult to examine the connection between technical progress and economic growth. Given the limits on handling aggregate data, we risk distorting the results by the methodology involved in calculating the national income, the evaluation of capital, and prices. Only studies focused on Soviet growth sectors seem to be able to yield results, but it is always difficult to identify the factors which directly influence growth. Nevertheless, the study of planning of research and development and technical progress, and their contribution to Soviet economic growth remains a great challenge.

[77] According to the calculations of Stephen Rapawy in *Estimates and Projections of the Labour Force and Civilian Employment in the USSR, 1950–90*, US Department of Commerce, Washington, DC, 1976. The annual increase in numbers of Soviet workers, which was 1·9 per cent during the years 1971–75, is projected to be only 1·5 per cent during the years 1976–80. The population of working age is also projected to increase by only 1·34 per cent per year during the years 1981–90.

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Technological Progress and Soviet Politics

Bruce Parrott

DURING the last decade Western scholars have begun to pay greater attention to the role that technology has in the functioning of the Soviet system. Economists now agree that the post-Stalin decline in growth rates has made the broader promotion of technological progress increasingly necessary, and students of international politics attribute many of the changes in Soviet foreign policy since the late 1960s to a desire for Western technology. Until now, however, the interaction of the Soviet Union's technological needs with its domestic political structure and its foreign policy has received little systematic attention. This interplay warrants careful study because Soviet politics and Soviet technology are likely to exert an increasingly powerful effect on one another in the coming years.

The interaction between the two is, of course, an extremely complex subject, and the present article does not pretend to fill the gaps in our knowledge of it. Rather, the article aims to provide an inventory of questions for further study, a sampling of the evidence which needs to be considered, and some tentative answers to the questions posed. The questions fall under three headings: the Soviet leaders' assessments of the importance of accelerated technological progress; the difficulties of speeding up the rate of advance through the reform of domestic institutions; and the possibilities of meeting the USSR's needs by greater reliance on Western technology.

The Problem of Technological Progress [1]

From a political perspective, perhaps the most important question is how Khrushchev's successors have appraised the seriousness of accelerated technological progress. This question is a logical point of departure since the answer determines whether the persisting Soviet weakness in some fields of technology should be attributed to unavoidable defects in the Soviet system or simply to a lack of serious concern on the part of the leadership. The answer also affects judgments about the degree of change in domestic or foreign policy which Soviet leaders are likely to accept in order to overcome the country's technological shortcomings. Major changes of policy will eventually

[1] In this article the general issue of economic efficiency and the particular issue of technological progress are treated together. The two are not identical, but are often discussed by Soviet leaders in a way which makes it impossible to treat them separately. In the article "technological progress" is taken to mean the creation and initial application or subsequent diffusion of militarily or economically beneficial technology.

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occur only if a dominant segment of the leadership accepts the gravity of these shortcomings.

In evaluating the importance of stepping up the pace of technological progress, the Soviet leaders must take into consideration two main factors. The first is the international standing of their country. Today, as in the past, the Soviet Union's economic and technological performance in comparison with that of Western countries has profound implications for Soviet military and political influence abroad. One reason that the decline in Soviet growth rates since the mid-1950s has vexed the Soviet leadership is that the same period has witnessed a dramatic improvement in the growth rates of the USSR's capitalist rivals by comparison with the record of the 1930s.[2] The narrowing of the gap between Soviet and Western growth rates has raised unsettling questions about the capacity of the Soviet system to overtake the West, and it has prompted some leaders to endorse the acceleration of technological change as a central means of restoring the USSR's former superiority in rates of economic growth.

The second factor is the domestic requirements of Soviet society. In some measure international and domestic considerations are interconnected; sluggish Western economies are often less able to support arms increases, and this condition may reduce the pressure of the Soviet military budget on Soviet domestic spending. But the two sets of considerations are not identical. It is now widely accepted that a slow-down in the growth of Soviet labour supply and other economic inputs requires the intensification of economic production if current growth rates are to be sustained. From the standpoint of the present Soviet leadership it is desirable to sustain those rates not only to maintain the USSR's international standing but also to satisfy domestic needs more fully, e.g. by spending more heavily on the consumer goods needed to motivate the labour force. And accelerated technological progress has a key place in all prescriptions for a transition to more intensive economic growth.

Have Khrushchev's successors concurred on the seriousness of the international and domestic pressures for accelerated technological progress? It seems that they have not, especially where judgments of the relative technological capacities of Soviet socialism and Western capitalism are concerned. A survey of the statements of some of the most prominent members of the Politburo shows that the leaders have differed significantly in their treatment of the problem. While some have been quite sanguine, others have been quite apprehensive, as I hope to show below.

In the years immediately after Khrushchev's fall, the more sanguine, traditional view was articulated by Mikhail Suslov and Leonid

[2] Joseph Berliner, "Some International Aspects of Soviet Technological Progress," *The South Atlantic Quarterly*, 72 (Summer 1973), pp. 346–47.

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Brezhnev. In 1967 Suslov expressed an unequivocal belief in the economic and technological strengths of the Soviet system:

> In the half century of its existence and development the socialist system has passed unprecedented tests and trials of political strength, defence capacity, and economic effectiveness. Class enemies—internal and external—" tested " and " tried " it by fire and sword . . . by " cold war " and harsh competition in the field of development of economy and science. The socialist system has passed through all these trials with honour, and has demonstrated indisputable advantages over the capitalist system in political, military, socio-economic and scientific-technical respects.[3]

Between 1964 and early 1968 Brezhnev, though he did not put the case quite so strongly, adopted a similar stance. While acknowledging some of the problems of promoting technological advance, he nevertheless took to task the " separate workers " who " clearly underestimate the achievements of scientific-technical thought in our country and the other countries of socialism " and who " are inclined to exaggerate the achievements of science and technology in the capitalist world." In fact, he asserted, socialist planning ensured " unprecedented possibilities for the flowering of science and the utilization of scientific-technical progress." [4]

Not everyone within the top leadership agreed with this view. In 1966 Aleksei Kosygin betrayed some concern when he remarked that " the course of the economic competition between the two world systems depends in enormous measure on the degree of the development of science and on the scale of the use of research results in production " and itemized the impediments to innovation in the USSR.[5] He showed still greater apprehension in 1969:

> Preserving its aggressive nature and not refraining from further militarization, from military preparations, and above all from the race in atomic missiles, imperialism is putting great emphasis on the aspects of the struggle of the two world systems which are connected with the development of the economy, science, technology and education.
>
> Characteristic of the highly developed capitalist countries is the acceleration of the processes of concentrating and centralizing production and capital, and the strengthening of state regulation of the economy. As a result, in recent years there have been noted in these countries an increase in rates of economic growth, a heightening of capital output, a reduction in the material intensity of production, a growth of labour productivity with a minimal increase in the number of employed persons, and a heightening of the effectiveness of production. . . .
>
> In spite of economic contradictions, the currency crisis, and inflation, the intensification of social production and the scientific-

[3] M. A. Suslov, *Izbrannoe: rechi i stat'i* (Moscow: Politizdat, 1972), p. 512.
[4] " Rech' tovarishcha L. I. Brezhneva," *Pravda*, 30 Mar. 1969, p. 1.
[5] *XXIII S"ezd KPSS* (Moscow: Politizdat, 1966), II, p. 13.

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> technical revolution in certain measure today permit the leading imperialist states to have additional possibilities of manoeuvre in the areas of the economy and social policy. . . . The contemporary bourgeois state is increasingly becoming a kind of coordinating centre which develops and implements the economic policy of monopoly capital. It uses the most diverse means of ensuring adequately high and stable rates of economic growth and the further development of scientific-technical progress.[6]

Adopting a similar attitude, a 1970 article in *Kommunist* cautioned that "it is extremely dangerous to manifest slowness in using the enormous advantages of socialism over capitalism in the area of comprehensive and accelerated development of science and technology and the improvement of administration."[7] The implication was that the developed capitalist states had raised a new economic and technological challenge which required that the Soviet leadership respond with major changes in policy.

Towards the end of the 1960s this note of apprehension spread to some of the more traditionally-minded members of the political leadership. Brezhnev's shift of ground after mid-1968 exemplifies this tendency. In a speech to the December 1968 plenum of the CPSU Central Committee, Brezhnev said:

> As is known, the scientific-technical revolution is unfolding not only here, in the countries of socialism, but also in the capitalist world. It is occurring on an increasingly large front, producing a genuine turn-about in one branch of the economy after another, opening new possibilities for heightening the productivity of labour, improving the administration of production and the organization of labour. . . .
>
> It may be said without exaggeration that scientific-technical progress has now become one of the main bridgeheads of the historical struggle of the two systems. . . . It is also important to underscore this side of the matter because in recent years the main capitalist countries, especially the USA, have strenuously built up capacities in the most progressive branches of industry and have increased their allocations for scientific-technical goals many-fold. They are connecting not only the solution of their internal problems with the use of the latest results of scientific-technical progress, but also the strengthening of their economic and political expansion in many areas of the world.[8]

Unpublished until the 1970s, this statement marked a change of outlook which Brezhnev first openly expressed in a June 1969 address. The 1969 address included elements of the more traditional view of capitalism which Brezhnev had earlier espoused; but it also contained

[6] A. N. Kosygin, *Izbrannye rechi i stat'i* (Moscow: Politizdat, 1974), p. 438.

[7] V. Lisitsyn and G. Popov, "Razvivat' leninskuiu nauku upravleniya," *Kommunist*, No. 1 (1970), p. 58.

[8] L. I. Brezhnev, *Ob osnovnykh voprosakh ekonomicheskoi politiki KPSS na sovremennom etape* (Moscow: Politizdat, 1975), I, p. 374.

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several very forceful remarks about the importance of recognizing capitalist economic and technological strengths and the internal political changes " which in many respects, it would seem, even contradict the customary ' classical ' features of the capitalist system." [9] This warning paved the way for Brezhnev's seizure of initiative in the field of economic planning and industrial policy at the December 1969 plenum of the Central Committee. At that session he obliquely indicated for the first time that the 1965 industrial reforms had failed in some respects to improve the economy's effectiveness; he called for a " decisive improvement in the organization and administration of the economy," and threatened officials who resisted such criticism with demotion.[10]

Although Brezhnev's pronouncements at first seemed to foreshadow a distinct swing of leadership opinion towards a more critical estimate of the country's technological performance, this swing appears not to have materialized. For as Brezhnev's outlook grew more pessimistic, those who might have been expected to agree with him shifted towards a more optimistic view of the USSR's international technological standing. Kosygin's speeches typify this counter-trend. Early in 1971 he told the 24th Party Congress:

> Only the socialist system creates unlimited possibilities for scientific-technical progress. In contrast to the capitalist economy, the high, stable rates of growth of socialist production ensure Soviet persons full employment with an accelerated growth of labour productivity.
>
> It is precisely thanks to socialism and only within the framework of our social system that the scientific-technical revolution is fully and comprehensively developed, with its results becoming the property of all the workers.[11]

Kosygin added that " the Soviet economy at all stages of its development has always clearly demonstrated indisputable advantages over the capitalist economy," and offered comparative growth statistics which seemed to clinch the point (Japan was conveniently omitted from the comparison).[12] These words contrasted strikingly with Kosygin's depiction less than two years earlier of capitalism's " adequately high and stable rates of economic growth " and its " further development of scientific-technical progress." In embracing the notion of socialism's decisive technological superiority, which traditionalists like Suslov continued to expound,[13] he was muting the urgency of his earlier calls for improved Soviet economic performance.

[9] L. I. Brezhnev, *Leninskim kursom* (Moscow: Politizdat, 1973–76), II, pp. 368, 390.
[10] *Ob osnovnykh voprosakh*, I, pp. 416–18, 423, 428.
[11] *XXIV S"ezd KPSS* (Moscow: Politizdat, 1971), II, p. 19.
[12] Ibid. p. 24.
[13] M. A. Suslov, *Marksizm-Leninizm—internatsional'noe uchenie rabochego klassa* (Moscow: Mysl', 1973), pp. 226–27.

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It was probably pressure from his colleagues which caused Brezhnev, too, to move a part of the way back towards the traditional perspective. In his report to the 24th Party Congress he argued that capitalism's general crisis was continuing to deepen.[14] But it was evident that Brezhnev had shifted back towards this outlook with considerable reluctance. In his report he also underscored the use of science and technology by capitalist corporations to improve the effectiveness of production, cited capitalism's willingness to move towards "partial reforms," and implied that the orthodox picture of the economic changes occurring in capitalist countries as part of the scientific-technical revolution was an outdated "old formula" whose inaccuracy would only strengthen the hand of ideological revisionists.[15] It was also notable that, unlike Kosygin, Brezhnev offered no statistical comparisons of the most recent Soviet and Western growth rates.

THIS jockeying among the leaders can probably be traced to several factors, some of which have little to do with economics. A major aim of Suslov and those like him was to neutralize the influence on Soviet citizens, particularly dissidents, of unflattering socialist-capitalist comparisons. By 1970 Andrei Sakharov and others had begun to argue that democratization was essential to upgrade the Soviet Union's economic and technological performance,[16] and after the 24th Party Congress Soviet ideological officials moved to attack those who allegedly overestimated Western science and technology and were "trying to prove that the socialist system of economy is in contradiction with the requirements of scientific-technical progress."[17] Brezhnev, on the other hand, was probably genuinely concerned about the disappointing results of the 1965 industrial reforms,[18] which had been launched under Kosygin's stewardship, and he took these shortcomings as an opportunity to criticize industrial planning at the December 1969 plenum and to place several of his close associates in the planning organs during 1970.[19] Under political pressure from

[14] *XXIV S"ezd*, I, p. 38.

[15] Ibid. p. 129.

[16] The best example is the memorandum addressed to the Soviet leadership by A. Sakharov, R. Medvedev, and V. Turchin in early 1970. For the text see "Appeal of Soviet Scientists to the Party-Government Leaders of the USSR," *Survey*, No. 76 (1970), pp. 160–70. Other examples are Zhores Medvedev, *The Medvedev Papers* (London: Macmillan, 1970), and Roi Medvedev, *Kniga o sotsialisticheskoi demokratii* (Amsterdam: Alexander Herzen Foundation, 1972), esp. ch. XI. On the tendency of "instrumental-pragmatic dissenters" to move in the late 1960s from a circumscribed concern with "developmental rationality" to a concern with larger political issues, see Rudolf Tökes, "Dissent: The Politics of Change in the USSR," in *Soviet Politics and Society in the 1970s*, ed. Henry W. Morton and Rudolf L. Tökes (New York: Free Press, 1974), pp. 20, 23.

[17] P. Demichev, "Razrabotka aktual'nykh problem stroitel'stva kommunizma v resheniyakh XXIV S"ezda KPSS," *Kommunist*, No. 15 (1971), pp. 20–21.

[18] The results of the 1965 reforms are briefly treated in the following section.

[19] John Dornberg, *Brezhnev: The Masks of Power* (London: Andre Deutsch, 1974), pp. 244–47.

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Brezhnev, Kosygin naturally acquired a personal stake in defending the country's recent economic record, and his new emphasis on the defects of capitalism was motivated at least partly by a desire to make the record look better against a backdrop of Western economic crisis. But there was also some intellectual basis for his change of position. Between 1968 and 1970 the annual growth of GNP in the capitalist country to which the Soviet leadership pays the most attention, the US, dropped from 4·4 per cent to −·3 per cent.[20] Each leader thus tended to interpret a complex reality in terms of his own bureaucratic responsibilities and political interests.

The result of these diverse calculations was continued disagreement within the leadership about the sufficiency of the USSR's technological performance. Brezhnev, for one, refused to take any comfort from the decline in US economic growth. In mid-1971 he made one short statement noting unequivocally that capitalism was undergoing a serious crisis.[21] But in the following three years discussions of capitalism's economic and technological performance virtually disappeared from his speeches, while his campaign for a Soviet transition to the intensive mode of economic growth went ahead at full speed. The themes for the campaign were set out in Brezhnev's report to the 24th Party Congress, which urged a transition from the application of the " separate achievements of science " to the creation of a " high scientific-technical level of all production " and which contained a summons " organically to unite the achievements of the scientific-technical revolution with the advantages of the socialist system of economy." [22]

The exponents of the more orthodox views of Soviet socialism and of capitalism did not oppose these slogans outright, but they played down their significance in a way which apparently frustrated Brezhnev's priorities. Suslov, for example, continued to emphasize that Soviet growth rates were superior to those of the capitalist world, and towards the end of 1971 he observed that the scientific-technical revolution and socialism were now being united " in the very best way." [23] Less than two months after Suslov expressed his satisfaction, Brezhnev asserted that it was necessary to realize the 24th Party Congress's prescriptions for economic improvement " more rapidly and more energetically than has been done up to now," and he promised a Central Committee plenum on the subject of accelerating scientific-technical progress.[24] During 1972, however, no such plenum was held.[25] At the end of the

[20] " Economic growth of OECD Countries, 1965–75," US Department of State, Bureau of Intelligence and Research, Report No. 382, 1976, p. 6 (mimeographed).

[21] *Leninskim kursom*, III, p. 399.

[22] *XXIV S"ezd*, I, pp. 80, 82.

[23] Suslov, *Marksizm-Leninizm*, pp. 226–27, and *Izbrannoe*, p. 655.

[24] *Leninskim kursom*, III, pp. 475–76.

[25] In 1972 two plenums of the Central Committee were held. They were devoted to foreign policy and to discussion of the 1973 economic plan. *Ezhegodnik Bol'shoi Sovetskoi Entsiklopedii*, 1973, pp. 13–14. Nineteen months after his first mention of such a plenum, Brezhnev repeated his call for it. *Leninskim kursom*, IV, p. 218.

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year Brezhnev openly indicated his frustration with the impact of the 1965 reforms on the pace of technological advance and the quality of production; a " turn-about " in economic efficiency was necessary, he asserted, to solve the " enormous tasks " of meeting the competing economic demands of consumption, investment and defence.[26] A few months later he followed up with a call for " genuinely revolutionary " measures to create " a strong, firm alloy of science and production." [27] Meanwhile Suslov reasserted the traditional view, contending that " the decisions of the 24th Congress are being successfully realized; the course determined by the Congress—towards the further strengthening of the country's economy, the acceleration of scientific-technical progress and the improvement of the material conditions of the people—is being introduced in life." [28]

In the mid-1970s the discrepancies amongst the leaders still persisted. Under the impact of the extended Western economic crisis, Brezhnev returned by 1975 to a fully orthodox depiction of the economic problems of capitalism,[29] but he repeated his earlier emphasis on the necessity of changing over from quantitative increases of inputs to qualitative improvements as the main source of future Soviet growth. Declaring that the new five-year plan had to be " above all a five-year plan of quality," [30] Brezhnev reiterated that progress in this sphere did not satisfy him. In 1976, for example, he asserted that in the years since 1971 " the line of intensifying production has been realized more slowly than planned. . . . In many branches—in spite of the fact that this problem was repeatedly and insistently posed—the introduction of the achievements of science and technology into production today remains a bottle-neck." [31] And further:

> There are still types of production which are figured in reports as " new " but in fact are new only in terms of their date of manufacture, not their technological level. . . . Much remains to be done in order for the achievements of science to be embodied not only in individual—albeit the most brilliant—experimental and exhibit models, but also in thousands and thousands of new types of production, starting from unique machines and ending with all that is connected with improving the labour conditions and daily life of people.[32]

The more traditional members of the leadership, however, remained unimpressed by the need for more rapid technological progress. Suslov, for example, continued to dwell on the achievements of the Soviet economy. Reviewing its performance between 1970 and 1974, he said:

[26] *Ob osnovnykh voprosakh*, II, p. 253; *Leninskim kursom*, IV, p. 90.
[27] *Leninskim kursom*, IV, p. 218.
[28] *Marksizm-Leninizm*, p. 256.
[29] *Leninskim kursom*, V, pp. 181, 479.
[30] Ibid. p. 174.
[31] *XXV S"ezd KPSS* (Moscow: Politizdat, 1976), I, pp. 62–63.
[32] Ibid. pp. 71–72.

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> As in the past, our economy developed at high rates, and its technical level and manufacturing technology were continuously improved. . . . The scale and rates of industrial development . . . are extremely impressive. But the enormous quantitative growth is not all. Deeply qualitative changes are taking place in industry. Its technical level is being heightened, the methods and organization of production are being improved. Many types of new, more productive machines, mechanisms, apparatuses, instruments and other equipment are being created and assimilated. A broad programme of mechanizing labour-intensive work and automating production is being actualized. . . .[33]

The economic strengths of socialism, Suslov added, contrasted "especially clearly" with the comprehensive economic and political crisis gripping the capitalist countries.[34] His stress on the qualitative changes and technological improvements which had already taken place in the USSR diverged markedly from Brezhnev's description of such changes as goals for the future. The same divergence was manifested in the two leaders' treatments of the statistics covering innovation by Soviet industrial enterprises. Whereas Brezhnev had expressed the suspicion that many statistically "new" machines were outdated technologically, Suslov treated a rise in the figures on new machines introduced since 1970 as solid evidence of the "increasingly successful unification of the achievements of the scientific-technical revolution with the advantages of socialism."[35]

In the mid-1970s Kosygin's treatment of Soviet economic performance fell somewhere between these two divergent positions. On the one hand, he pointed out that the USSR was still lagging behind several Western countries in labour productivity, and he emphasized that a further acceleration of technological progress was "one of our cardinal tasks" if the 10th five-year plan was to be fulfilled.[36] On the other hand, he asserted that the pace of technological innovation by Soviet industry had already increased substantially since 1971,[37] and he implicitly cautioned against exaggerating the Soviet economy's difficulties. Stressing that the West was in its worst economic slump since the 1930s, he drew a lesson about the nature of the USSR's problems:

> We have become used to talking about our successes in developing the economy as something ordinary and obvious. This happens because our economy knows no slumps or crises; it grows at firm, high rates, and our economic problems are above all problems of growth and raising the effectiveness of production.

[33] "Po leninskomu puti k kommunizmu," *Pravda*, 12 June 1974, p. 2.
[34] Ibid.
[35] "Po zavetam velikogo Lenina," *Pravda*, 23 Apr. 1975, pp. 1–2.
[36] "Rech' tovarishcha A. N. Kosygina," *Pravda*, 12 June 1975, p. 2; *XXV S"ezd*, II, p. 24.
[37] *XXV S"ezd*, II, p. 11.

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> We see a completely different picture in the capitalist world. The economy of the industrially developed countries of the West continues to be in a period of deep and sharp difficulties.[38]

Hidden in these comments was an admonition to other Soviet officials for neglecting the Soviet system's achievements. In accentuating the contrast between socialism and capitalism, Kosygin may have meant to underscore what he saw as the system's real advantages. But he was also probably moved, as he had been in 1971, by a desire to keep economic criticism from going so far that it undermined his position as chief economic expert within the leadership. The overall effect of his statements was to make the campaign for accelerated technological progress seem less imperative than it did in Brezhnev's pronouncements.

The preceding survey suggests several tentative conclusions about the recent Soviet assessment of the need for technological progress. First, there has been a substantial measure of disagreement within the leadership over the urgency of making the transition to more intensive growth, in general, and more rapid technological advance, in particular. Secondly, the leaders' image of the USSR's capitalist rivals has affected their views of this need, but their treatment of capitalism has also been affected by their conceptions of the intrinsic technological requirements of Soviet society. Attaching great significance to capitalist performance as a yardstick of Soviet achievement, some leaders have taken comfort from the recent Western economic crisis; others have discounted the crisis and concentrated on what they see as a domestically conditioned necessity for a shift to intensive growth and accelerated technological progress. Thirdly, concern within the Soviet Union about technological progress is probably mounting significantly, but it is not mounting as rapidly as an analysis of the statements of a leader like Brezhnev might suggest. For reasons which are probably partly careerist and partly a matter of conviction, a process of equilibration has taken place among the various leaders' publicized views: some have expressed more anxiety about technological progress, others have expressed less.

Technological Progress Through Domestic Reforms

All the leaders who have shown concern about the pace of technological advance have indicated that it should be improved, at least partly, through the more rapid creation and application of indigenous technology. This means that the leadership must find better ways to discipline the massive political and economic apparatus which has evolved during the last half-century. Since this apparatus has ramified into increasingly specialized components, the leadership has encountered growing difficulty in eliciting high levels of performance from it.

[38] "Rech' tovarishcha A. N. Kosygina," p. 2.

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One source of the difficulty is the widespread inclination of specialized subordinates to falsify the information about economic capacities and reserves on which the leadership must base its efforts to evoke high performance. This is an especially thorny problem in the realm of technological change, since the real possibilities of new scientific ideas and new technologies are more arcane and less predictable than the possibilities of proven manufacturing methods and products; the potential for subordinate deception is correspondingly greater. Moreover, the uncertainty of the process of innovation requires a large measure of flexible cooperation among the scientific and managerial participants in the process, and the effort to force innovation through comprehensive administrative regulations is likely to induce them to pursue success in formalistic rather than substantive terms. Taut planning also makes the participants less willing to accept the economic risks of innovation. All this is a familar syndrome, but its consequences for technological innovation are graver than for other types of activity.

THE search for solutions to these problems is complicated not only by the intellectual difficulty of discovering an administrative pattern which can promote more rapid technological progress, but by the political difficulty of imposing such a pattern on the bureaucracy. One consequence of the diffusion of power since Khrushchev's deposition is that individual Soviet leaders have become more heavily dependent on bureaucratic constituencies for political support *vis-à-vis* one another, and this has made them quite cautious about proposing major institutional reforms. A successful policy for accelerating technological advance must therefore satisfy two criteria, of substantive effectiveness and of political feasibility, and a policy which meets one requirement may not be able to meet the other. The rest of the present section offers some thoughts on this problem in relation to three possible patterns of institutional change.

The first pattern can be called, without irony, rationalized centralism. The proponents of this approach put their hopes in a systematization of the existing administrative structure without any significant devolution of power from the centre. They anticipate that by introducing computers on a wide scale the information handling capacity of the centre can be sharply upgraded, and they believe that the development of Soviet "administrative science" will make it possible to change the operating style of central institutions and to eliminate some of the present disincentives to technological advance. This approach appears to have played a considerable part in Brezhnev's thinking on economic administration.[39]

Politically, this is probably the easiest form of change to advocate, but it is quite unlikely to work in substantive terms. It leaves intact

[39] See, e.g. *XXIV S"ezd*, I, pp. 81, 92–94.

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the institutions which in the past have demonstrated a lack of concern for the promotion of technological progress and which are capable of putting up formidable bureaucratic resistance to directives from above. The industrial ministries exemplify this problem. Since at least the mid-1950s they have been criticized for neglecting technological advance by failing to provide the requisite resources and by measuring the performance of their subordinate enterprises and institutes in ways which have little to do with real technological achievements.[40] In the 1970s these deficiences have continued to manifest themselves. The ministries have been rebuked for allocating too few resources to R & D, for assessing institute achievements in formalistic terms, and for refusing to cooperate with one another in major projects of technological innovation.[41] They have also connived to inflate industrial prices in a manner which preserves the price inducements for enterprises to go on manufacturing outdated technology.[42] It is hard to believe that the pursuit of administrative science or the introduction of computers can solve such problems. The Politburo and central planning agencies face the difficult task of regulating large industrial hierarchies which have many monopolistic features: a preponderant share of the production of essential goods, considerable control over the upward flow of information on their own performance, technical expertise which is often superior to that of their overseers, and reluctance to cooperate in the uncomfortable process of technological change. The ministerial incentive to cooperate is weak because of the absence of competition from other domestic producers or from foreign manufacturers, and this lack of competition also makes the leadership's job of appraising ministerial performance more arduous. It is conceivable that the Politburo might be able to galvanize the ministries into a marginal improvement of performance by discharging a large number of officials for their weak technological effort; but the main problem is one of structure rather than personnel, and for political reasons the current leadership is unlikely to take such a step.

A second possible approach to the acceleration of technological progress is partial decentralization. The essence of this approach is a limited devolution of economic authority which preserves a large measure of directive planning and falls short of free market relations. One variant of the approach is to increase the operational powers of individual enterprises and institutes. This variant enjoyed its greatest popularity in the 1960s; in 1965 the number of central controls

[40] See, e.g. "Supply National Economy with Perfect Machinery," *Current Digest of the Soviet Press*, VI, no. 43, p. 26, translated from *Pravda*, 23 Oct. 1954.

[41] V. Nevel'skii and M. Rostarchuk, "Vtoroe zveno," *Izvestiya*, 29 Jan. 1972, pp. 1–2. Ia. Kolotyrkin, "O rezervakh uvelicheniya otdachi ot nauchnogo potentsiala," *Kommunist*, No. 8 (1974), pp. 53, 57–58; "O khode rabot po avtomatizatsii tekhnologicheskikh protsessov v chernoi metallurgii," *Pravda*, 30 Aug. 1972, p. 1.

[42] V. Sitnin, "Tekhnicheskii progress i tseny," *Ekonomicheskaya gazeta*, 10 May 1971, p. 8.

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exercised over the enterprises was officially reduced, and in 1967 the controls governing many of the applied R & D establishments were also streamlined.[43] The hope was that, together with a restructuring of incentives, these steps would induce enterprises and institutes to cooperate more readily with one another in promoting technological advance.

The experience of the 1960s showed that this variety of partial decentralization has both political and substantive liabilities. Politically, it proved impossible to defend the enterprises' new measure of autonomy from their administrative superiors; the enterprise directors were either unable or unwilling to protect their rights against ministerial incursions. Substantively, the initial grant of greater autonomy to the enterprises produced an unexpected decline in the rate of technological progress. In the USSR there are numerous impediments and disincentives to innovation at the enterprise level,[44] and the 1965 reform inadvertently strengthened the impact of the existing financial disincentives by reducing the central administrative pressure which had previously sustained the process of innovation. As the reform was gradually extended to more and more enterprises, the number of prototypes of new machines and instruments created each year fell off sharply.[45] So did the introduction of prototypes into the regular production cycle. Between 1965 and 1968 the fraction of the nine machine-building branches' output constituted by new machines and equipment dropped from 13·8 per cent to 8·2 per cent.[46] For a political leadership which had already expressed some concern about the performance of its industry, these fruits of the 1965 reform must have been perplexing, and they help to explain why Brezhnev began a campaign at the end of the 1960s for the acceleration of technological advance. They also help to explain why the idea of enterprise autonomy came into increasingly ill repute towards the end of the decade.

The regime's response was to turn to a second variant of partial decentralization: the creation of scientific-technical and industrial associations. One major purpose of setting up such associations is to bring together under a single organizational umbrella the research and manufacturing units responsible for the various phases of producing a new piece of technology. This step, it is hoped, will remove some

[43] For the pertinent decrees, see *Resheniya partii i pravitel'stva po khozyaistvennym voprosam* (Moscow: 1967–74), V, pp. 640 ff., and VI, pp. 363 ff.

[44] For a thorough analysis of these factors, see Joseph Berliner, *The Innovation Decision in Soviet Industry* (Cambridge: MIT Press, 1976).

[45] For the full series of statistics, see *Narodnoe khozyaistvo SSSR*, 1964, p. 190; ibid. 1965, p. 205; ibid. 1966, p. 266; ibid. 1968, p. 267; ibid. 1969, p. 230.

[46] L. M. Gatovskii, *Ekonomicheskie problemy nauchno-tekhnicheskogo progressa* (Moscow: Nauka, 1971), pp. 110, 113. For further evidence of the reform's negative results, see V. Gogosov, and L. Zotova, "O nekotorykh voprosakh stimulirovaniya tekhnicheskogo progressa," *Voprosy ekonomiki*, No. 7 (1968), p. 109.

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of the administrative impediments which have plagued relations among R & D establishments and industrial enterprises.

This sort of decentralization appears to be somewhat more practicable politically than the transfer of greater authority directly to individual enterprises. The regional party organs constitute a powerful bureaucratic constituency which favours the formation of associations, and over the last eight years they have vigorously pressed the ministries to step up the rate at which associations are being created. The ministries have resisted this pressure, as have many city Party officials and enterprise directors, who fear a loss of the limited freedom provided by the remoteness of their ministerial superiors.[47] Since 1973 the reorganization of the ministries to include associations has been official policy, and on the surface this step suggests a victory for the regional party organs. But the size of the associations and their powers have continued to be objects of contention. Some ministries are attempting to re-label their existing principal administrations as associations without allowing any devolution of power, and the deadline announced in 1973 for completing the reorganization has since been pushed forward from 1975 to 1980.[48] The final form which the associations will assume thus remains uncertain.

In view of this fact, it is still rather early to evaluate the technological impact of the associations. Reports on the smaller associations, particularly those in Leningrad, indicate that they have provided a major improvement in the time needed to create many varieties of new technology, and Soviet figures on the introduction of industrial prototypes into regular production have begun to climb since 1970.[49] On the other hand, this statistical index is especially susceptible to misrepresentation in reporting, and at least one leader, Brezhnev, has expressed the suspicion that this is what has been occurring.[50] Moreover, the growth of labour productivity in the associations, while it was a full 2 per cent higher than in the rest of industry during 1969, has since shown a tendency to converge with the general industry rate.[51] It is therefore difficult to tell whether the associations will generate a significant improvement in technological performance, or whether their early successes have simply been an instance of the "hot-house effect" which often occurs when new economic arrangements are first

[47] *Opyt organizatsii i raboty khozraschetnykh ob"edinenii v promyshlennosti*, ed. A. P. Dumachev and A. K. Varsobin (Leningrad: Lenizdat, 1970), pp. 35, 62–64, 166–67.

[48] Alice Gorlin, "Industrial Reorganization: The Associations," in US Congress, Joint Economic Committee, *Soviet Economy in a New Perspective* (Washington: Government Printing Office, 1976), pp. 164, 166.

[49] *Narodnoe khozyaistvo SSSR*, 1973, p. 185.

[50] The figures are susceptible to misrepresentation because they do not indicate the proportion of total production constituted by new output. Unfortunately, I have been unable to locate any of the more reliable statistics on proportions for the period since 1970. Brezhnev's suspicion of the published post-1970 statistics was briefly treated in the preceding section.

[51] Gorlin, op. cit. p. 179.

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EDITORIAL ANNOUNCEMENT

Beginning with the Winter 1977-78 issue (Vol. 23, No. 102), *Survey* will be published under the auspices of the London School of Economics and Political Science (University of London). Members of the L.S.E. Centre on International Relations and other professors from the L.S.E. are joining their colleagues who are already on the *Survey* International Advisory Board. At the same time Freedom House in New York will assist in the production of the journal, which will continue to be distributed by Oxford University Press. We are grateful to all concerned.

The first two issues of Vol. 23 (Nos. 102 and 103) will be devoted (as was No. 52 in 1954) to Soviet science and technology. In the main they are based on contributions to the Workshop on that theme which was supported by the National Science Foundation, Washington, and organized by J. R. Thomas, the Soviet Programme Director at the National Science Foundation. The opinions of the individual authors are their own and do not reflect the views of the National Science Foundation or of the U.S. government. In addition, some *samizdat* material is included in No. 103 to illustrate Soviet dissident scientists' perceptions of problems relevant to the subjects discussed.

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IMPORTANT NOTICE

SURVEY Volume 23, 1977-78

As subscribers will know, no issues of *Survey* were published in 1977. *Survey*, Vol. 23, will now be published in four issues during 1978 and will be called the 1977-78 volume. The sequence of volumes during the years 1976-79 will thus be:

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tried on a limited scale. The most important questions are how seriously the associations will be influenced by the same disincentives, e.g. prices, which have inhibited innovation by industrial enterprises, and whether the diffusion of technology among manufacturers working in a single industrial branch will occur more rapidly than in the past. On balance, however, the chances are that the kind of improvement which the associations may bring will not satisfy those within the leadership who are most committed to stepping up the rate of technological progress.

A third possible means of accelerating technological advance is radical decentralization. Sharply reducing the directive element in central planning, this step would allow research establishments and industrial enterprises to exercise far larger powers of self-direction, and it would entail technical and economic competition in a market setting. The purpose of this step would be to furnish stronger incentives and greater flexibility than the system of central controls has thus far been able to furnish for the participants in the R & D cycle.

THE public support for such ideas has been extremely limited and quite oblique. Kosygin has come the closest to endorsing this sort of decentralization by emphasizing that producers must be made more sensitive to market demands and by stressing the need to limit the powers of central agencies.[52] But these statements in 1964–65 were far from conclusive, and Kosygin has since retrenched his position.[53] A more forceful criticism of technological monopolies and a demand for direct competition among R & D establishments came in 1967 from V. Trapeznikov, Deputy Chairman of the State Committee for Science and Technology, who implied that competition should be extended to other societal activities as well.[54] Perhaps the most enthusiastic advocacy of such views has come from outside the leadership, from a segment of the Soviet economics profession.

The support for radical decentralization is clearly outweighed by the bureaucratic opposition. The ministries and central planning organs are against the idea. The same attitude probably characterizes the regional party organs, which would also lose by such an extensive transfer of power. Nor have the enterprise managers shown any desire to receive such wide-ranging authority. Most enterprise spokesmen appear to have backed the limited increase in powers embodied in the 1965 shift toward profit criteria,[55] but many found even this change of

[52] Kosygin, *Izbrannye rechi*, pp. 190, 210, 217.

[53] Abraham Katz, *The Politics of Economic Reform in the Soviet Union* (New York: Praeger, 1972), p. 129.

[54] V. Trapeznikov, "Effektivnost' nauki," *Pravda*, 18 Jan. 1967, pp. 2–3.

[55] Richard Judy, "The Economists," in *Interest Groups in Soviet Politics*, ed. H. Gordon Skilling and Franklyn Griffiths (Princeton: Princeton University Press, 1971), p. 238.

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economic practice hard to cope with.[56] A survey of about 250 directors in 1970 found that more than three-quarters wanted greater power to make decisions on labour and wages; but fewer than a fifth wanted greater power to fix prices. Receipt of the right to select suppliers and buyers on their own initiative ranked sixth in the list of priorities, well behind the need for an improvement in the existing system of material-technical supply.[57] Most enterprise directors appear to desire security far more than they desire administrative freedom, and the proponents of strong central planning have sought to enlist this sentiment by dramatizing the economic threat which market competition would pose to the security and welfare of many enterprises.[58] An important question is whether a similar desire for security characterizes other parts of the technical intelligentsia, particularly in the area of applied R & D. Like industrial managers, the directors of applied research establishments have often urged an increase in their administrative prerogatives; but to my knowledge none has publicly endorsed the idea of competition as an incentive to better technological performance. The experience of the 1965 reforms, however, suggests that market competition may be necessary to make greater freedom effective technologically.

These are some of the political and organizational problems confronting the Soviet leadership in the effort to promote more rapid technological advance. Disciplining and reorganizing the Soviet bureaucracy is a formidable task, and the difficulties of the process have been one factor which has prompted some leaders to look elsewhere for the technology which they feel their country needs.

Technological Progress Through Foreign Trade and Technical Aid

An alternative to generating more technology domestically may be to obtain more technology abroad, especially from the industrial West. In considering this possibility the Soviet leadership has had to face at least two major questions. The first is whether the Soviet system needs the additional technology badly enough to engage in cooperative undertakings which will probably be of some economic benefit to the West as well. Particularly in periods of international recession or depression, the contribution of such ties to the stabilization of capitalist societies must be considered by Soviet policy makers. A second question is whether the East-West ideological conflict and expanded economic cooperation can be adequately insulated from one another. Enlarged technological ties must not be allowed to undermine

[56] Katz, op. cit. pp. 155–56; Karl Ryavec, *Implementation of Soviet Economic Reforms* (New York: Praeger, 1975), p. 47.

[57] R. G. Karagedov, "Reforma glazami direktora," *Ekonomika i organizatsiya promyshlennogo proizvodstva*, No. 1 (1970), pp. 101–107.

[58] See, e.g. "Ekonomicheskaya teoriya i khozyaistvennaya praktika," *Planovoe khozyaistvo*, No. 11 (1968), pp. 9–10.

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the doctrinal basis of the regime, nor must they make the regime susceptible to intense economic pressure from its opponents abroad.

Since about 1972 the Soviet leadership has judged that the prospective benefits outweigh the anticipated costs, and it has sought greatly increased trade and technical ties with the West. Just how firm the support for this new policy is within the leadership is very difficult to say. A preliminary survey of the speeches of prominent Politburo members shows no evidence of overt opposition to the change. There is, though, a noticeable difference between Brezhnev's vigorous endorsements of "long-term, large-scale economic cooperation" and Suslov's rather neutral allusions to the new policy.[59]

The idea that differences over this issue are present at the highest level is made more plausible by the existence of a veiled debate on the question among secondary Soviet commentators. In mid-1975, for example, *Kommunist* published an article on international economic relations which defended closer ties with the West. The author went out of his way to quote Lenin's rebuff to the "ultra-revolutionaries" and "demagogues" who opposed beneficial, business-like relations with capitalist countries after the October Revolution in the belief that "one of the systems must 'be removed'."[60] Since the object of the article was to show the relevance of Lenin's ideas on international economics to the present period, the implication seemed to be that some persons were still failing to appreciate his wisdom on this point. A few months later *Pravda* printed an article commemorating the anniversary of the 14th Party Congress which interpreted the Leninist legacy in quite a different manner. Heavily emphasizing the danger of capitalist encirclement during the 1920s, the writer praised the Congress for selecting an autarkic course of economic development which prevented the Soviet Union from becoming an appendage of capitalism and which strengthened its ability to revolutionize the workers of other lands. The critics of this programme at the 14th Congress, he argued, had advocated a policy which was "aimed at . . . permitting and strengthening the country's dependence on the world capitalist system" and which "signified, in essence, the rejection of the construction of socialism." The author clearly felt that the debate at the 1925 Congress was relevant to the USSR's present situation. "The Leninist teaching . . . on which the 14th Congress was based," he said, "is also compelling for the contemporary period—for developed socialism."[61] The latent message seemed to be that the expansion of economic ties with the West would be a mistake which might endanger Soviet

[59] *Leninskim kursom*, IV, p. 327; M. A. Suslov, "Vtoroi S"ezd RSDRP i ego vsemirno-istoricheskoe znachenie," *Partiinaya zhizn'*, No. 15 (1973) pp. 17, 21; "Beseda s delegatsiei senata SShA," *Pravda*, 1 July 1975, p. 4.

[60] E. Pletnev, "Zhiznennaya sila leninskikh idei o vsemirnykh ekonomicheskikh otnosheniyakh," *Kommunist*, No. 6 (1975), p. 116.

[61] K. Suvorov, "Po puti sotsialisticheskoi industrializatsii", *Pravda*, 18 Dec. 1975, p. 2.

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socialism. Given the public expression of such divergent views, it is possible that the leaders' positions on the question of turning to the West for technology are not as unified as official rhetoric suggests, and the nuances in their treatments of the subject warrant more study in the future.

Aside from the top leaders, several other bureaucratic groups within the Soviet elite probably have strong opinions about the wisdom of expanding Western economic ties, since the policy will have a substantial effect on the prerogatives which they now enjoy. How much impact their attitudes will have on the USSR's overall policy depends on the measure of unity prevailing within the top leadership; in case of serious disagreement at the top, the impact of their views could be profound. It is therefore important to reflect for a moment on how some of these secondary elite members may regard expanded technological ties with the West.

Who is likely to support expanded ties? Although the Soviet military is often considered an advocate of caution in East-West relations, there are factors which may prompt it to back closer ties. If such ties promise an opportunity to obtain strategic equipment which Soviet industry cannot produce on a satisfactory level, e.g. computers, the military may give their support. The armed forces may also have an indirect interest in Western technical assistance. To the degree that Western technology contributes to the Soviet economy's efficiency, the pressure of civilian needs on the military budget may be alleviated. Of course there is a danger that the political leadership might try to use a general relaxation of East-West tensions to cut the defence budget. But this has not yet occurred, and Soviet military leaders have expressed the belief that the policies of relaxing tensions and strengthening the armed forces are mutually reinforcing.[62]

A second group which is likely to favour expanded technical relations with the West consists of those industrialists who believe that imported producer goods will help them meet the leadership's demand that they should raise their output to world technical levels. Those for whom this demand is most painful are probably to be found in the sectors which have received low priority in the past or have for other reasons lagged well behind Western technology; oil production, chemicals, and consumer goods fall within this category. Officials in the oil industry, for example, have generally been enthusiastic about the prospect of greater reliance on Western technology. Around the end of 1974 the Minister of Oil Industry, V. D. Shashin, endorsed this idea,[63] and a number of his colleagues in the Council of Ministers probably share this sentiment.

[62] William E. Odom, " Who Controls Whom in Moscow," *Foreign Policy*, No. 19 (Summer 1975), p. 122. See also Karl Spielmann, " Defence Industrialists in the USSR," *Problems of Communism*, XXV, No. 5 (Sept.–Oct. 1976), pp. 67–68.

[63] Michael Simmons, " Western Technology and the Soviet Economy," *World Today*, Apr. 1975, p. 169.

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Support for closer ties can also be expected from part of the technical intelligentsia, particularly natural scientists. As early as 1951 the officials of the Academy of Sciences began delicately to push for closer contacts with foreign scientists, before the political authorities approved this idea,[64] and today members of the Academy continue to advocate such contacts. They see closer connections with the West not only as a means for the better dissemination of Western scientific information, but also as a way of providing Soviet scientists with stronger inducements to do creative work.[65]

Who is likely to resist the expansion of Western ties? The regime's ideological officials appear to dislike the idea. These officials are charged with protecting the doctrine of the USSR's scientific and economic superiority over capitalism, and heavy reliance on Western technology would make this claim more difficult to defend. Ideological specialists are especially inclined to distrust programmes of technology transfer which require extensive personal contact between Soviet experts and Westerners. As one of them put it in late 1968:

> Not disdaining any means, bourgeois propagandists try to exert their influence on our scientific-technical intelligentsia. Besides all other means, they attempt to use for this purpose any international meeting of scholars and specialists, any stay by Soviet persons abroad. . . . Sometimes our scholarly institutions send abroad persons who do not stand out by their special principles or maturity. . . . [These persons] accept as true the words of bourgeois propagandists.[66]

Rather than calling for the restriction of foreign contacts, the author urged better Soviet propaganda and more attention to the problem from regional party committees. But it would be quite surprising if assertions of this kind were not used in private to buttress the argument for limiting contacts with the West.

For similar reasons, the political police also distrust the idea of strengthened Western ties. An especially harsh exposition of this view was published in 1971 by an official closely identified with the Committee for State Security. Underscoring the "total" character of foreign intelligence efforts to subvert the Soviet system, the author expressed special concern about the loss of state secrets. The USSR's growing economic, scientific and military might, he maintained, made the preservation of these secrets more urgent than ever before:

> Because the objective historical factors of social progress are promoting the unswerving growth of the socialist system, the capitalist world is resorting to various means in its efforts to

[64] A. N. Nesmeyanov, "International Cooperation of Scientists," *Current Digest of the Soviet Press*, III, no. 8, pp. 8–10, translated from *Literaturnaya gazeta*, 28 Apr. 1951; Tony Longrigg, "Soviet Science and Foreign Policy," *Survey*, XVII, no. 4 (1971), p. 46.

[65] Kolotyrkin, "O rezervakh . . . ," p. 62.

[66] N. Sviridov, "Partiinaya zabota o vospitanii nauchno-tekhnicheskoi intelligentsii," *Kommunist*, No. 18 (1968), pp. 39–40.

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> attain economic and technical supremacy. Imperialist intelligence agents are conducting economic espionage in socialist countries, attempting to obtain scientific and technical information and facts about discoveries and inventions.
>
> The agents of the imperialist powers, especially the CIA, are attempting to use for espionage purposes various trade-union, youth, scientific and other organizations, specialists in the fields of science, technology, military affairs, persons in culture and art, journalists, representatives of business circles. Cases have been noted in which some foreign specialists working on the construction of a series of enterprises in the USSR were used for subversive purposes.[67]

The author went on to claim that foreign intelligence services also sought to suborn Soviet citizens, especially at international scientific conferences and exhibitions, and sometimes succeeded. He also directed a few words of censure to Soviet officials who were too free in discussing state secrets.[68] Plainly he saw personal contacts between Soviet specialists and foreigners primarily as a political danger, with little to be gained and much to be lost.

Since the early 1970s, of course, official Soviet policy has swung markedly towards more extensive Western ties, and statements such as above seem to have disappeared from the press. But the leadership has explicitly coupled its economic overtures to the West with a policy of stepped-up struggle against social and political ideas of Western origin, and writers dealing with the subject of propaganda continue to emphasize the importance of combating imperialist "ideological sabotage," especially within the scientific-technical intelligentsia.[69] It is therefore probable that most ideological and police officials remain deeply sceptical of the value of Western scientific and technical assistance, particularly because their bureaucratic responsibilities do not force them to confront directly the economic problems which this aid is intended to alleviate.

If resistance from these groups seems more or less predictable there is another group whose resistance is more surprising: officials in producer goods industries. No doubt many of these administrators favour such ties, as indicated above. But some of them oppose increased reliance on foreign technology, because it constitutes an implicit recognition of their failure to match Western competition and threatens their branches' prospects for rapid growth in the future. In late 1975, for example, the head of one of the most prominent applied

[67] S. Tsvigun, "Revoliutsionnaya bditel'nost'—neot"emlemoe kachestvo sovetskogo cheloveka," *Politicheskoe samoobrazovanie*, No. 2 (1971), pp. 46–47. Between 1957 and 1963 Tsvigun served as head of the Committee for State Security in Tadzhikistan; from 1963 to 1966 he served in the same capacity in Azerbaidzhan.

[68] Ibid. pp. 47–48.

[69] V. Chaplin, "Raionnyi komitet partii i nauchno-tekhnicheskaya intelligentsiya," *Kommunist*, No. 7 (1974), p. 47. See also V. Iagodkin, "Nekotorye voprosy ideologicheskoi raboty v sovremennykh usloviyakh." ibid. No. 3 (1974), p. 39.

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research establishments for the machine-building industries published an article which argued that the USSR should concentrate on producing machines for export, since they were more profitable than exports of raw materials, and should step up the expansion of the machine-building branches partly for this purpose. Questioning the utility of purchasing foreign licences, the designer asserted that by the time licensed production was set up the goods were often outdated technologically. He went on to endorse imports of foreign machines, but "only within general limits" and only in sectors where the USSR lacked the necessary manufacturing experience, e.g. in household appliances and automated lines for producing consumer goods. In the sectors where the country did have considerable manufacturing experience, he contended, Soviet industry could produce machines surpassing the technical levels of the output of the best foreign firms. In this category he listed several machine-building branches and cited as justification three recent instances in which Western machinery installed in the USSR had proven unsatisfactory and been replaced with Soviet equipment.[70] At about the same time an editorial in *Planovoe khozyaistvo* claimed that international cooperation in science and technology, including the purchase of foreign licences, was a "major reserve" for accelerating the pace of technological advance. Noting that many ministries were still trying to solve technical problems which had been solved abroad long before, the editorial stated that "in a series of instances" the officials of scientific organizations viewed a decision to purchase foreign licences as a derogation of their own scientific achievements. Rejecting such logic, the editorial called for a further extension of foreign technological ties.[71] Along with the evidence cited earlier, this journalistic exchange indicates significant resistance within the Soviet bureaucratic apparatus to a large-scale expansion of dependence on Western technology.

GIVEN the divisions within the elite over the advisability of Western technological ties, it is very difficult to tell how Soviet policy in this area will evolve in the future. But it is probably safe to say that future trends will depend in considerable measure on the degree of compatibility which emerges between established Soviet economic institutions and the strategy of extensive foreign technological borrowing. One possibility is that such borrowing may yield large economic benefits and thereby help to ease the pressures for domestic economic reform. This is undoubtedly the hope of some Soviet proponents of expanded Western ties, and if it is borne out their political position will be strengthened. Most Western scholars, however, doubt that by itself

70 A. Tselikov, "Segodnya i zavtra nashego mashino stroeniya," *Kommunist*, No. 13 (1975), pp. 67, 73–75.

71 "Sovershenstvovat' planirovaniya vnedreniya nauchno-tekhnicheskikh dostizhenii v proizvodstvo," *Planovoe khozyaistvo*, No. 11 (1975), p. 8.

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a greater infusion of Western technology will have such positive consequences. The Soviet economy is so vast that the amount of equipment required to produce a large impact on its performance cannot be purchased abroad; moreover, without substantial improvements in Soviet management, most imported technology will function below its designed level of productivity.[72] It is true that a significant economic yield might be obtained indirectly, e.g. by building additional Soviet factories modelled on the turnkey plants installed by Western corporations. But here, too, the administrative capacity of Soviet economic institutions is a crucial issue. Without a change in these institutions, the diffusion of Western technology will probably encounter many of the same obstacles which already plague the diffusion of technology generated domestically.[73]

If this is so, it may lead to one of two other possibilities. One is that the policy of expanded Western borrowing will be defeated by a political alignment which emphasizes the policy's comparatively small benefits and which is convinced that any far-reaching economic reform is still unjustified. The other is that the need to make good use of Western technology will become one argument supporting the case of a less traditional political alignment which would be powerful enough to force through a major restructuring of the country's economic institutions.

[72] Joseph Berliner, " Prospects for Technological Progress," in *Soviet Economy in a New Perspective*, p. 435.

[73] Philip Hanson, " International Technology Transfer from the West to the USSR," ibid. pp. 805–809.

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Soviet Technological Performance*

Ronald Amann

THIS paper summarizes the work of a team of researchers, located at the Centre for Russian and East European Studies, University of Birmingham and is the result of close collaboration between social scientists and engineers. Each of the 10 participants in the project attempted to evaluate the comparative level of Soviet technology in a key sector of the economy. It was felt that a substantial number of sectors should be examined, varying both in their degree of governmental priority and research intensity, in order to obtain a balanced picture. The study which was published in full in autumn 1977,[1] contains a great deal of detailed analysis and evidence; careful consideration of this material is indispensable for a satisfactory understanding and evaluation of our work.

Perhaps it is appropriate to begin with the general question—why should a group of scholars be interested in establishing the comparative level of Soviet technology? This is not as obvious as it might seem at first sight. The interests of businessmen and politicians are easier to discern. For the former, detailed studies of Soviet technological performance reveal clues about the future trading behaviour of the USSR while for the latter, the results of such studies provide an essential starting point for estimating some of the wider implications of technology transfer and for forming political judgments about them. These judgments would not, of course, follow *automatically* from assessments of Soviet technological level and in extreme cases might diverge widely on the basis of the same evidence: for those already predisposed towards *détente*, Soviet technological backwardness might provide the argument that nothing would be lost by further substantial injections of Western technology, or conversely and paradoxically, that due to Soviet parity with the West it would be futile to deny technology to a country which was evidently capable of developing it for itself; those of an opposite cast of mind might respond to news of Soviet technological backwardness with relief or be even more resolved to "turn off the tap" if the result were more favourable to the USSR. Our study is tangentially related to these aspects, but its main inspiration lies elsewhere.

In 1969, the OECD published its general survey of Soviet science policy, to which three of us at Birmingham contributed the section on

* © R. Amann 1978.

[1] R. Amann, J. M. Cooper and R. W. Davies, *The Technological Level of Soviet Industry*, Yale University Press, New Haven and London, 1977.

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science and industry.[2] The OECD report examined the way in which an administered economy handles the process of innovation and attempted to measure the research and development effort in the USSR; however, it said very little about technological "outputs" and consequently provided no firm basis for resolving the vexed question of whether the Soviet R & D system was relatively *efficient* or *inefficient*. It is virtually impossible to decide whether the "capabilities" and "problems" identified by the OECD report and other similarly conceived studies are significant ones without recourse to precise indices of the comparative *performance* of the nation and its constituent branches of industry. This is a perennial problem for the researcher as he ploughs his way through the Soviet press and economic journals: how far are the critical comments of officials and academics that he reads objective and how far are they coloured by insufficient knowledge of Western practice, by the desire to exhort people to greater efforts, and by an environment which strongly encourages specific criticisms of a practical kind? It was largely in response to this problem that our study was conceived; namely to supplement the existing body of work at a crucial point by the provision of hard evidence.

Aggregated and Disaggregated Assessments of Soviet Technology: Some General Observations about Methodology

Direct assessments of the level of technology can be obtained by comparing the operating characteristics of particular processes or the quality of their end-products. In the case of machinery, for example, this might involve the comparison of such indices as reliability, power per weight ratio or operating speed. But as Komzin has pointed out,[3] these indices are numerous and tend to be specific to particular items of equipment. In cases where they are a common feature they differ in importance depending upon the exact purpose of the equipment; moreover, the task is made even more difficult by the proliferation of technical standards and tolerances, which are often not strictly comparable. Thus, in the absence of general engineering criteria, direct assessments of the level of technology are necessarily confined to a very limited range of equivalent machines. It would be dangerous to base any general conclusions on individual studies of this kind unless the technology involved could be shown to be a "key" one, which decisively influenced the overall level of a branch of industry or the economy as a whole.

As an alternative to this confusing mass of detailed engineering

[2] R. Amann, M. J. Berry and R. W. Davies, Part V, *Science Policy in the USSR*, OECD. Paris, 1969.

[3] B. I. Komzin, "Problemy ekonomicheskoi otsenki urovnya tekhniki," in *Sovremennaya nauchno-tekhnicheskaya revolyutsiya v razvitykh kapitalisticheskikh stranakh*, Moscow, 1971, p. 215.

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data, the evaluation of which demands highly specialized knowledge, a neater approach is to attempt to isolate the level of technology and its rate of change by means of macro-economic methods. Probably the most simple criterion that might be used for this purpose is labour productivity, on the grounds that the level of labour productivity at any given point in time or its growth over a given period of time reflects the accumulated level of technology or its rate of development, respectively. Unfortunately, this is a very partial and incomplete indicator because it fails to differentiate the strictly technological factors from other important influences on productivity such as the amount of capital per worker, economies of scale, and the degree of utilization of productive capacity.[4] A more satisfactory approach is to apply some measure of total factor productivity. Assuming that output is a function of the main productive factors, capital and labour, increases in output that cannot be accounted for by increases in factor inputs are attributed to a residual combination of influences often equated with " technical progress." These relationships are commonly expressed in the form of a production function. For the most part, economists have been interested in using total factor productivity as a measure of technical *change* (or " dynamic efficiency ") over time, though in some cases, notably that of Bergson, it has been used as a non-dynamic measure of the *level* of technology (or " static efficiency ") in different economies. From a general methodological point of view the use of production functions represents a distinct improvement upon a simple measure of labour productivity, but a number of critical problems remain, notably in the calculation of the input variables and in deciding what the measure of " technical progress " that is produced really means; Professor R. Nelson has referred to this as " a measure of our ignorance! " [5]

Although no member of our research group was a professional econometrician, we felt that it was important, at a fairly early stage in our activity, to get to grips with some of the major macro-economic work on the subject as well as the more detailed micro-studies with which we were more familiar; the reading list that we prepared for ourselves included a selection of the most widely cited studies of Western economies (Solow, Denison, Jorgenson and Griliches, Arrow, etc.) together with a more comprehensive coverage of assessments of Soviet " technical progress," from Seton (1958) through to the most recent work of Bergson, Gomulka and Desai. These studies are, of course, well known to specialists in Soviet economic affairs and it is unnecessary to discuss them at length here. It is sufficient to say that we were struck by a number of technical difficulties that appear to be unavoidable in such assessments, namely (a) what factors to adjust for

[4] E. Mansfield, *Industrial Research and Technological Innovation*, London, 1968, p. 3.
[5] R. Nelson, " Aggregate Production Functions and Medium-range Projections," *American Economic Review*, Sept. 1964.

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in measuring capital and labour inputs and how to price these inputs in Soviet and Western countries; (b) the extent to which "technical progress" is exogenous or endogenous; (c) why one specification of a production function should be preferable to any other and (d) whether simple measures of output in value terms capture the full effect of "technical progress." Some of these problems come to a head in the interpretation of the "residual" which in the Soviet case would fail to discriminate between the effects on productivity of innovation and the diffusion of new technology, on the one hand, and such factors as increased effort and motivation due to Party campaigns, greater specialization and amalgamation of industrial enterprises and the impact of economic reforms (for example, the use of the profitability indicator, the imposition of a capital charge and the extension of the Shchekino experiment, which were introduced to encourage better factor utilization). It is interesting that in a recent critical survey of Soviet macro-economic work, which came out in the early 1970s, the author refers to the residual picturesquely as a *chulan dlya khlama* (literally, "lumber room" or "glory hole") and argues that it is a serious mistake to attribute the whole of the growth of the *chulan* to the influence of science.[6] Thus, macro-economic studies did not appear to isolate the influences of technological progress (or technological level) as we had defined them in our study; the broader influences that the residual does capture are, of course, important and well worth measuring. Considerable variations in both the results and methods employed in Western macro-economic assessments of Soviet "technical progress" make it awkward to generalize. However, the pattern that seems to emerge is that the *rate* of technological development in the USSR during the post-war period has been superior to that of the United States and roughly on a par with that of other major Western countries, while the cumulative *level* of technology continues to be inferior to all major Western countries, particularly to the United States.

In contrast to the approaches described above, the authors of the case-studies of technological level undertaken at Birmingham all chose to use disaggregated forms of assessment.[7] We accept the important limitation that disaggregated estimates are essentially "clusters of insights" which are difficult to rank in order of importance. But this approach can be justified on a number of grounds. First, it does not appear that aggregated approaches produce results which command general agreement. It is true that a subjective element creeps into the

[6] L. Glyazer, *Voprosi Ekonomiki*, 1971, No. 9, pp. 61–76. Glyazer is implicitly criticizing the inflated estimates of Trapeznikov and others, who use these estimates to argue for more substantial allocation of resources to R and D at a national level.

[7] A somewhat similar approach was adopted by the OECD: *Gaps in Technology*, Analytical Report, OECD, Paris, 1970. In addition to this summary volume there are detailed sector reports: *Scientific Instruments* (1968), *Electronic Components* (1968), *Plastics* (1969), *Pharmaceuticals* (1969), *Non-ferrous Metals* (1969).

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interpretation of disaggregated criteria, but in macro-economic comparisons these assumptions, judgments and approximations are implicit in the various stages of the calculation and, indeed, are often inevitable in view of the poverty of the statistical data. Secondly, since our future aim is to try to understand how the research-production cycle works in particular Soviet industries, aggregate estimates of technical level are much less useful than more specific measures of research, development and diffusion; the latter provides a quantitative indication of strengths and weaknesses, which can be explored in future work.

The main ground that we cover is summarized in Figure I. In most of the case-studies all these criteria are applied, but not always in detail. Often this is because the data are not available or because the measure is not relevant to the particular industry or technology involved; in other cases, we did not have the expertise or the time available to squeeze out inaccessible information. However, assessments of innovation and diffusion are common to nearly all the case-studies.

Before concluding these introductory remarks, it is necessary to be more self-critical about the significance of results produced by the methods described above. The *manifestations* of technical level and change that are identified and measured by these approaches are in some ways more ambiguous than those that are the concern of aggregate economic assessments or of engineering assessments. While aggregate economic estimates are concerned with overall increases in productivity, and engineering assessments compare the operating characteristics of equivalent items of equipment, our approach largely focuses on comparative patterns of technical development and diffusion. There is a danger of ethnocentricity in this. What is to be the standard of comparison? It is generally accepted, for example, that the United States exhibits all the characteristics of a technologically advanced society in their most mature form. It is tempting to carry this assumption a stage further and to *define* advanced technology as that pattern which prevails in the United States; the level of Soviet technology in particular industries could thus be assessed in terms of how far it matched the American pattern. This may be true in many cases but it could be misleading in others. The approach raises two particular difficulties. First, it leads one to ignore or diminish the significance of indigenous technology, where that technology is not diffused widely in Western countries. The paradigm case here might be that of deciding whether modern anaesthetic techniques are more "advanced" than acupuncture; a similar problem crops up with some Soviet man-made fibres (for example, "Enant"/Nylon–7) which apparently have good technical characteristics but are not produced in large quantities in Western countries. A second objection to the above approach is that it assumes that all countries are striving towards a uniform pattern of development and does not take into account the economic appropriateness of particular patterns of technology, which

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Figure I: Schema for Assessing the Level of Soviet Technology

Phase of Assessment	Criteria	Industries or Sectors of Technology to which Criteria are Applied
1. Research	Number of papers	High Voltage electric power transmission
	Citations	
	Nobel Prizes	Chemical industry
2. Inventiveness	Patents (registered at home and abroad)	Computer technology
3. Innovation	Comparative dates of first commercial production in different countries	Iron and steel industry
	Comparative parameters of key items of equipment	Machine tools
	Technology transfer as substitute for indigenous innovation	Numerically controlled machine tools
		Passenger cars
4. Diffusion	Comparative rates of diffusion of key technologies	Military technology (tanks and ICBMs)
	Patterns of diffusion manifested in composition of industrial output	Space rockets
	Patterns of foreign trade in industrial products	Industrial process control instruments

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are influenced by factor endowment and domestic consumption. If we take the chemical industry as an example, the optimality of the pattern of output at a given point is, to some extent, dependent upon the relative costs of inputs and the ability of other industries to use sophisticated chemical products. The fact that the Soviet Union produces large quantities of fertilizers and simple inorganic chemicals relative to modern synthetic materials could be seen in relation to the substantial deposits of minerals in the USSR and the conservatism of Soviet manufacturing industry in substituting synthetic materials for traditional materials. Under these circumstances it is difficult to judge how far the pattern of innovation and diffusion in the USSR is determined by technological backwardness and how far by conscious economic choice. It is true that one of the explicit aims of Soviet economic policy is self-sufficiency and a desire to catch up with and eventually overtake the United States in production capacity and technology. But even if Soviet pronouncements were accepted at face value, it seems unlikely that these objectives would be reflected in total emulation. Thus, to some extent, it is necessary to look at the Soviet pattern of technical development and diffusion within its *own* economic context.

Synopsis of Main Findings

Our results appear to confirm several widely believed stereotypes about the capacity of the Soviet economy to promote technical progress. Looking first at the *innovation phase*, Soviet technological performance in high priority military-related sectors is relatively good compared with (and, perhaps, at the expense of) the lower priority areas of civilian technology. In terms of thrust power, for example, Soviet space rockets were more advanced than those of the United States until the launching of Saturn V in 1967; Saturn V had twice the thrust power of Proton and eight times that of Vostok. No new Soviet rocket emerged subsequently which could match this performance. Several key areas of military technology present a somewhat similar picture of advanced achievement, which has tended to fall away slightly in recent years. The Soviet T-34 tank and its post-war successor the T 34/85 were generally recognized at the time as the best in the world, but a systematic comparison of the Soviet T-62 and the American M-60 in terms of protection, firepower and mobility, reveals that this lead in tank technology has now been eroded by more recent Western models. The rate of innovation in ICBMs has been less rapid in the USSR than in the United States from 1955–75, especially with regard to accuracy and multiple warhead technology, while a study by the Rand Corporation [8] suggests that a technological gap between the USA and the

[8] R. Perry, *Comparisons of Soviet and US Technology*, R and R-827-PR, Santa Monica, 1973, pp. 24–34.

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USSR in turbine engines opened up between 1955 and 1971. Several of the technologies mentioned above require such enormous resources for their development that, effectively, only the United States and the Soviet Union are playing in the same league; hence, the USSR possesses a substantial technological lead over *other* Western countries. It seems reasonable to suppose that matching the United States in these sophisticated technologies could only have been accomplished by concentrating scarce materials and the activities of the most skilled specialists upon them, leading to a squeeze on resources in other sectors of lower priority.

In the broad area of civilian technology, the relative capability of the USSR to develop new technologies and bring them to commercial production appears to be most evident in the less research-intensive industries, especially where those industries have been the recipients of long-term governmental priority. The iron and steel industry, for example, has played a central role in Soviet economic strategy since the industrialization drive of the 1930s. At present, Soviet blast furnaces and open hearth furnaces are among the largest and most advanced in the world (for example, the 5000m^3 blast furnace, completed in 1974). Moreover, the USSR was among the first countries to develop oxygen steel making and continuous casting, both pioneered by the Austrians in the early-mid 1950s; on the other hand, the USSR generally lags behind Western countries in the manufacture of alloys, high quality steels and rolling technology. Historically speaking, electrification represented one of the other major pillars of Soviet industrialization, and the electric power industry is one in which the Soviet Union is well advanced. For example, high voltage power transmission (HVAC and HVDC) is important in Soviet circumstances because it reduces power losses over the large distances which separate the generating stations from the main centres of consumption. If we accept line voltage as an appropriate measure of technological sophistication, then by this criterion the USSR moved into a leading position in the mid-late 1950s and has remained among the leaders subsequently.

In contrast to the traditional industries referred to above, the most acute problems have been experienced in fostering innovation in the new, dynamic, research-intensive industries such as computers, polymer chemistry and electronics, which have only recently attracted the attention of the leadership. The chemical industry, for example, was relatively neglected until 1958, and when the dates of first commercial production of synthetic materials in different countries are compared systematically, there is no evidence of a diminution in the Soviet lag behind the West during the last 20 years; the USSR has never pioneered the manufacture of a major commercial plastic or fibre, and since 1958 it has been the last among the leading chemical-producing nations to begin full-scale manufacture of these products, often aided by substantial imports of Western plant and equipment.

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The lag between the USSR and major Western countries in the development of numerically-controlled machine tools widened in the 1960s and has only narrowed in the last few years; a major obstacle here is the inadequacy of the control system, which reflects the overall backwardness of the science-based electronics industry. This phenomenon has wider implications. For example, according to the criterion of operations per second, the gap between the best Soviet computer and its best American equivalent has not narrowed appreciably since the 1950s, and in the sphere of industrial process control instruments the lag is even more dramatic. No new Soviet pneumatic or electronic controller has been developed since 1964, whereas new systems tend to be developed, on average, every two years in Britain.

Considering the constituent phases of the "research-production cycle" for each of the case-studies (research→experimental development→innovation→diffusion) our general impression is that the preliminary stages are relatively more successful than the final stages (though outside the field of chemistry our evidence for evaluating the level of Soviet research is rather patchy). As both Derek Price [9] and Kapitsa [10] have demonstrated, the volume of Soviet scientific work as reflected in the output of published papers is very substantial and is only exceeded by that of American scientists. In view of the large numbers of scientists employed in the USSR, this result is perhaps not surprising and may even, as in the view of Kapitsa, be a cause for concern. The quality of this research output, however, is mixed. Some recent surveys of Soviet scientific literature in the fields of semiconductor thin films, chemical laser research and high-power gap switches, published by the Rand Corporation, identify areas of strength as well as of relative inferiority.[11] A citation count, carried out by one of our contributors, showed that in 1973 23·9 per cent of citations in the main Soviet polymer journal were from Western publications, while only 7·3 per cent of citations in the equivalent Western journals were from Soviet publications; East European journals also rated the West more highly in applied research and considerably more highly in fundamental polymer research. A more extensive analysis of citations undertaken in the Soviet Union reaches similar results but attributes the low level of Soviet citations in the West to the isolation of the USSR from the main information streams of world science rather than to the lower level of its research.[12]

[9] D. J. Price, in *Journeys in Science: Small Steps, Great Strides*, 1967.

[10] P. Kapitsa, *Komsomol'skaya pravda*, 20 Jan. 1966. Kapitsa calculated that in 1965 the USSR produced only half the number of scientific papers produced in the United States although it had nearly the same number of scientists.

[11] G. Rudins, *Soviet Research in Semiconductor Thin Films: A Survey*, R and R–1181–ARPA, Santa Monica, Feb. 1973; Y. Ksander, *Soviet Chemical Laser Research*, R and R–921/1–ARPA, Santa Monica, Nov. 1971; S. Kassell and C. D. Henricks, *Soviet Research and Development of High-Power Gap Switches*, R and R–1333–ARPA, Santa Monica, Jan 1974.

[12] V. V. Nalimov and Z. M. Mul'chenko, *Naukometriya*, Moscow, 1969.

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The final stage of the " research-production cycle " is the diffusion of new technology and here our evidence is more plentiful and hence more reliable. The only previous attempt to examine at a general level the comparative rate of diffusion of Soviet and United States technology is Boretsky's study of the years 1940–62, published in 1966.[13] Although Boretsky's quantitative assessment of the rate of Soviet technological change was unsuccessful, for reasons adduced by Berliner and others, a number of his individual indicators in our opinion provide very useful pointers to comparative changes in the technological levels of the two countries. With some modifications of the original sample, we extended our calculation of Boretsky-type indicators to 1973. The relatively more rapid Soviet technological advance, which Boretsky observed in the latter part of his period (1955–62), on the whole continued. In 1955–73 as a whole, although the lag in iron and steel technology continued and a lag developed in electric power transmission, the Soviet Union developed more rapidly than the United States in terms of electric power per worker and in composition of machine-tool stock, as well as in plastics and synthetic resins and the number of telephones in the economy. Our comparison with three other major industrialized countries for the same period shows that in terms of these indicators technological advance was more rapid in the USSR than in the United Kingdom, though less rapid than in West Germany or Japan.

It is important to note that the Soviet pattern of diffusion of new products and processes remains strikingly different from that to be found in the industrialized capitalist countries in two related respects. First, some Soviet industries which have continued to expand rapidly are industries in which the rate of growth has slowed down considerably in other major countries; hence, for example, plastics and man-made fibres have replaced steel and cotton in the USSR much more slowly than elsewhere. This conservative pattern of diffusion can also be discerned within particular Soviet industries. Compared with Western countries, new technologies such as oxygen steel, non cellulose-based synthetic fibres and polymerized plastics, for example, tend to drive out old products and processes more slowly. In part, this reflects the fact that availability of labour in the past has permitted the Soviet authorities to retire inefficient productive capacity less rapidly; but technological conservatism has also stemmed from the economic mechanism and its insufficient encouragement of the diffusion of new technology. It might be argued that in some Soviet industries the *per capita* output of products is so low compared with Western countries that an unsatisfied demand exists even for traditional goods. However, this could not explain the sluggish development and diffusion of new

[13] M. Boretsky, in *New Directions in the Soviet Economy*, Joint Economic Committee of the US Congress, part II-A (1966), pp. 133–256.

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processes, of which industrial process control instruments represent, perhaps, the most striking example.

IN view of the methodological difficulties inherent in this exercise, our overall verdict about Soviet technological performance compared with that of major Western countries is bound to be subject to a wide margin of error. If pressed to make such a judgment, however, it would be as follows. In most of the technologies we have studied there is no evidence of a substantial diminution of the technological gap between the USSR and the West in the past 15–20 years, either at the prototype/commercial application stages or in the diffusion of advanced technology. Three reservations should be made. First, we have covered only a limited number of technologies. It is not clear whether our present selection is likely to have been to the favour or disfavour of the USSR. The bias has been towards technologies in which the USSR is normally believed to be in a strong position: we have not yet completed a study of a consumer goods industry. It is possible that Soviet technology has improved more rapidly in the previously most backward industries, but otherwise our selection is likely to be biased in favour of the USSR. Secondly, and this will have led us to underestimate the technological level of the USSR, we are likely to lack knowledge of the most recent achievements in the USSR to a greater extent than in the case of Western countries. Thirdly, there is some evidence that the position has improved in the past four or five years in certain respects: n.c. machine tools provide an important recent example of rapid diffusion; and quality of production in a number of industries has recently begun to improve.

The results of our work are, we hope, useful in establishing the present technological capabilities of the USSR, but we suspect that these conclusions alone are not accurate predictors of future performance. Whether the USSR will eventually catch up with the advanced Western countries is a question which naturally has enormous commercial and political implications but, it cannot be answered by simple extrapolation and projection from existing trends. The fundamental reason for this is that we do not yet know *why* Soviet technology is on the whole backward. How the Soviet research and development system operates is the major determinant of technological performance, and changes in this major condition, less obvious and much more difficult to assess than selected statistics, could have a decisive impact. Of course, a good deal is already known about this (the recent work of Granick, Graham, Berliner, Nimitz and Nolting, Feshbach and many others has been important), but our knowledge is still incomplete at certain crucial points. An assumption which pervades much Western writing on the subject is that Soviet problems are deeply rooted, systemic and almost incapable of solution short of major political and economic reform. To date, there has been no

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serious attempt to evaluate how far Soviet technological performance in particular sectors can be explained by systemic weaknesses and how far by historical backwardness and deliberate (though, perhaps, misguided) policies and priorities. Moreover, even if, as seems probable, systemic problems play the major part, there have been concerted attempts since the late 1960s to transform the Soviet research and development system, to move it away from the inbuilt structures and attitudes that were formed during the industrialization drive of the 1930s. This is important to assess because not only do the many critical comments in the Soviet literature alert us to systemic problems but they also reveal an appreciation of these problems and a desire to correct them. Thus, the emergence of a new "consumer-contractor relationship" between R & D organizations and industrial enterprises in several ministries, the growth of personal incentives for research personnel (embodied in the "Karpov experiment"), attempts to squeeze out labour reserves and pave the way for more advanced automated processes (the "Shchekino experiment"), new forms of comprehensive central planning for nationally important projects, and last but not least the broad development of science-production combines, must all be carefully studied as part of a general pattern. Is a new research and development system crystallizing in the USSR, capable of meeting modern demands? This is the key question.

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Technology Transfer to the Soviet Union*

Philip Hanson

ECONOMISTS writing about technology transfer have not yet settled on an agreed terminology. It is probably best to follow the literature in which the phrase " technology transfer " is used with no special transnational connotation. Here a distinction is made between vertical transfer in stages of the product cycle (e.g. going from applied research to development and from development to production), and between horizontal transfer, i.e. transfer between places or institutions at a given stage of the product cycle. (Mansfield 1975 (b), p. 372.)

International technology transfer is then a special case, and one can distinguish between international transfer which is horizontal (a chemical plant built in the USSR by a Western contractor, for example, which incorporates processes already incorporated in plants built in the West) and vertical international transfer.

When Western research results or technical documentation are used in Soviet development and design, or a Western product is treated as a prototype and " reverse engineered " (copied) for Soviet production, the international transfer involved is a vertical one—even if it merely replicates a vertical transfer that has already been effected in the West. It is common knowledge that this has been a standard Soviet practice, and Sutton has provided many detailed examples (Sutton 1973).

If we consider all the forms of vertical as well as horizontal international technology transfer it is clear that we are looking at a more or less universal phenomenon in which all countries are involved. Fundamentally, international technology transfer occurs whenever production in one country benefits from technical knowledge previously available only abroad.

The transfer of Western technology to the USSR will be considered here on the basis of this very broad definition. The evidence would be easier to assess if we confined ourselves to, say, machinery and know-how trade. But the danger of doing this is that one loses sight of the many other ways in which the Soviet economy acquires Western technology. These other channels have been and still are of great importance, and they generally constitute alternatives (though often

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only second best alternatives from the Soviet point of view) to substantial trade.

In the remainder of this section, I shall first of all deal with the economic distinctions between embodied and disembodied transfer and between different levels or phases of transfer; secondly, with the distinction between negotiable and non-negotiable channels of transfer. Finally, I shall note some of the general propositions that have been advanced about the role of international technology transfer in economic growth.

The distinction between embodied and disembodied transfer is analogous to that between embodied and disembodied technical change. For our present purposes we can think of embodied transfer as the transfer of technology embodied in products, especially machines. Disembodied transfer will then refer to useful technical knowledge carried by persons or documents. Embodied transfer, to be effective, usually needs to be accompanied by some disembodied transfer. But the degree of emphasis on one or the other has implications for the domestic R & D sector. If a technology is transferred without the actual hardware that embodies that technology, a substantial contribution will probably be needed from the domestic R & D sector before the new product can actually be produced or the new process used. Buying in the necessary hardware (embodied diffusion) will generally reduce the domestic R & D inputs required; but it will usually have a higher balance-of-payments cost.

On the other hand, the acquisition of hardware alone will generally entail only limited gains for the purchasing country. In the first place, machinery by itself does not usually give the full and immediate information needed on how to make that machinery. It does not tell the buyer how to make the " next generation " of machinery that the supplier may have at an advanced development stage. The sale of licences, know-how, training and/or design engineering services may help in one or both of these respects.

In the Soviet case the proportion of embodied and disembodied transfer is therefore likely to vary over time and between sectors of the economy. It should depend on the planners' assessments of four things: the capabilities of their R & D sector in a particular field, the balance of payments, the prospect for product payback in the industry being considered and the rate of change of the technology in question in the potential supplier country or countries.

Another important distinction concerns the precise potential of what is transferred. This is the distinction between levels of transfer and is best illustrated by an example. Mineral fertilizers can usually be most cost-effectively applied at planting time if they are available as complex (poly-nutrient) granulated fertilizer. Time is then saved in handling and application, and losses due to wind and rain are less. A country which does not produce complex granular fertilizer might

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increase its overall productivity by importing the product. In the medium-term it might gain more by importing a plant to make complex granular fertilizers (e.g. as a turnkey project). It would gain still more if, along with the turnkey project, its technologists, engineers, and managers learned how to reproduce similar plants without further recourse to foreign suppliers.

These three different levels of transfer are referred to by Mansfield as material transfer, design transfer and capacity transfer, respectively (Mansfield 1975 (b)).[1] These distinctions are useful because they help us to think more clearly about the impact of the transfer process. Again, a progressively greater contribution will generally be needed from domestic R & D as we move from material to design to capacity transfer. Capacity transfer entails an ability to diffuse imported technology by indigenous effort. In the Soviet case our assessment of this ability is crucial to our assessment of the consequences of Soviet import of Western technology.

Where technical change is rapid—as is typically the case in research-intensive, " high-technology " industries—the purchase of licences, know-how and training is likely to be required for effective capacity transfer.

Not all channels of technology transfer can really be controlled by governments. To discuss East-West policy coherently it is important to be clear what is and what is not within the competence of Western policy makers. Here the distinction betwen negotiable and non-negotiable channels of transfer is useful.

On the one hand we have channels of transfer such as occasional visits of scientists, technologists, technicians, and managers; the perusal of Western technical literature, including patents; industrial espionage; and the reverse engineering of single imported machines or components. These all involve only small expenditures of foreign currency and can be used even between two countries which are dealing with one another " at arm's length." For practical purposes these channels are beyond government control except in a war or an acute international crisis. I have suggested elsewhere that it is useful to classify these as " non-negotiable " channels of transfer (Hanson 1975, p. 26).

On the other hand there are channels of transfer such as frequent and regular visits by scientists, technologists and others; the training of managers and operatives abroad or by visitors from abroad; substantial imports, especially of machinery; licence and know-how trade; industrial cooperation; and direct foreign investment. These, in contrast, can be termed " negotiable " channels. They tend to require " framework " commercial and other agreements between governments.

[1] My own distinction between technology " acquisition " (material and design transfer) and technology " assimilation " (capacity transfer) serves a similar purpose (Hanson 1975). Mansfield's terminology is preferable, however, because it draws an additional useful distinction and also fits more neatly into the general terminology of the subject.

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The Importance of International Technology Transfer

There is no doubt that in the early stages of the product cycle—applied research and invention—there tends to be a great deal of movement of people, ideas, documents, etc., across national boundaries (Jewkes, Sawers and Stillerman, 1969). It is equally clear that in the post-war world major successful innovations (first commercial production of a new product or with the use of a new process) have come predominantly from the United States, with a fair number also coming from Western Europe, notably the UK and West Germany (OECD 1970). If technical change is the major source of economic growth that it is now generally thought to be, the process of international technology transfer would therefore appear to be of great importance to the growth of the world economy as a whole and also to the growth of all national economies—with the possible exception of the US economy. (This proposition should perhaps be modified to allow for the possible importance of minor adaptations and incremental improvements of a basic technology.)

Yet this observation tends to be neglected in the analysis of the economic growth of particular countries. International transfer certainly figures in much of the literature on the " sources of growth " and also in the literature on multi-national companies. But it is probably fair to say that the analysis of national economic growth performance tends to put more stress on investment and capital-formation, entrepreneurship and domestic innovation and diffusion as determinants of national growth rates than on the international transfer of technology.

The work of S. Gomulka is a striking exception (Gomulka 1971, 1973, 1974). He argues that the gap in general technology level between any given country and the technologically most advanced country is a major determinant of international differences in growth (Gomulka 1971). In his view the embodied and disembodied diffusion of technology from the most advanced countries tends to be the major determinant of technical change (and hence, in his model, of economic growth) in medium-developed countries. As he points out, it is the medium-developed economies which tend to grow fastest, and he ascribes this to the powerful effect on them of diffusion from economies at or near the world technology frontier. This powerful effect tends to lessen, however, when the gap becomes very narrow.

Thus, a country's openness to the diffusion of advanced technology from abroad (once it has developed sufficiently to absorb such technology) becomes a more important determinant of long-run growth performance than the rate of capital formation or the size of the domestic R & D sector.

It may be noted here apropos of the Soviet case, that Gomulka's model for international economic growth does not include differences of economic systems as an independent variable. Indeed, the differences

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in national economic growth rates over 40 years or more, cited in support of his approach, suggest that differences in levels of development are more powerful influences on long-run growth rates than differences of economic system. However, there is a good deal of evidence of a micro-economic kind that in the past 20 years or so the Soviet economic system has been technologically less dynamic than the capitalist West (Amann 1976, Slama and Vogel 1976, Sutton 1973). In so far as this lack of dynamism shows up in the sort of macro-economic evidence that Gomulka considers, it would be ascribed in his 1971 model to a relative lack of "openness" to foreign technology. In this respect Gomulka's approach may fail to bring out important aspects of the Soviet experience in absorbing Western technology.

In later work Gomulka treats embodied diffusion in the form of machinery trade as a key, and possibly dominant, form of international technology transfer (Gomulka 1973 and 1974). The share in domestic investment of machinery imported from more advanced countries becomes in this work a major determinant of economic growth: the growth rate of a medium-developed country can be raised by increasing that share. (The present author, looking at Soviet machinery imports from the West, also treated this share as significant but was inclined to attribute to it effects less powerful than those posited in Gomulka's model (Hanson 1975).)

A recent US Department of Defense Study (ODDR and E, 1976) puts less stress on machinery trade as such and gives turnkey projects and sales of know-how priority as being the most effective form of transfer. The difference of approach is, however, more superficial than real. The Department of Defense study is concerned with major, "revolutionary" technological developments in a small number of high-technology industries, and with the forms of transfer that could most facilitate Soviet advance in such fields. This is only a subset of the issues with which we are concerned here. Moreover, know-how and training are seldom sold to the USSR without substantial accompanying hardware. Machinery imports should be a good indicator of overall negotiable transfer.

Sutton argues that almost all civilian technology in the USSR and a good deal of military technology, too, is more or less directly "borrowed" from the West and that significant domestic innovation, at least in the civilian sphere, has been almost entirely absent. He presents a great deal of detailed evidence for this. One great merit of his case studies for the 1945–65 period is that they show the importance of inconspicuous modes of transfer, particularly the reverse engineering and scaling-up of Western machines treated as prototypes.

He does not ask, however, whether the Soviet experience is really very different from that of other late-industrializing countries. (Gomulka's work, of course, treats Soviet long-run productivity growth as fundamentally similar to that of Japan or Italy, and explicable in

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the same terms.) If we consider Sutton's case-studies and Gomulka's international macro-economic model together, we can draw from them a useful general perspective on the Soviet acquisition and use of Western technology.

First, the Soviet Union shares with other late developing countries a pervasive utilization of technology developed in the more advanced countries. Secondly, the Soviet Union's political semi-isolation from the West has led it to acquire and utilize American and Western European technology in ways rather different from those used by, say, Japan. A predominant use of non-negotiable, disembodied transfer was, at least until recently, only to be expected. That so much of Soviet civilian R & D has been devoted to reverse engineering, modifying and scaling-up Western products is therefore less of an indictment of the Soviet economic system than Sutton suggests. Arguably, Soviet civilian R & D has been performing an adaptive and imitative role that was appropriate to the level of Soviet development, given the absence of Western direct investment and the relatively low level of trade with the West.

What matters now, so far as Western policy is concerned, is the precise role that negotiable technology transfer from the West plays in Soviet growth strategy, the efficiency of Soviet institutions in implementing that strategy, and the broader social consequences of negotiable transfer. This raises first of all the question of what recent Soviet policy has been—a question to which we now turn.

Soviet Policy

A. Soviet Technological Levels

It has long been common knowledge that there was an East-West civilian technology gap. A systematic general picture of the extent and nature of the Soviet problem, however, is only just beginning to emerge from recent research. Top Soviet policy makers themselves have probably begun to grasp many aspects of the problem only over the past 15 years or so, and this is reflected in policy changes over transfer from the West.

A recently completed study by a Birmingham University team has produced the following preliminary conclusion: ". . . in most of the technologies we have studied there is no evidence of a substantial diminution of the technological gap between the USSR and the West in the past 15–20 years (early 1950s to around 1970), either at the prototype/commercial application stages or in the diffusion of advanced technology." (Amann 1976.)[2]

The areas of civilian technology studied were reasonably representative: electric power transmission, chemicals, computers, iron and steel, machine tools, motor vehicles, oil drilling and process control

[2] This is a preliminary account of the study published in full by Yale University Press.

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instruments. The assessment of comparative levels was done primarily by establishing the Soviet lead or lag (in years) at several different points of time between the early 1950s and early 1970s. Leads and lags were assessed separately for different stages in the product cycle: as far as possible, for research, prototype/pilot-plant stage, first commercial production and diffusion. Comparison was made with a number of Western countries but principally with the USA, West Germany and Japan. (See Amann in this volume.)

Relative weaknesses (*vis-à-vis* the West) were particularly apparent in the vertical transfer to commercial production and in diffusion. The precise reasons for these weaknesses are being investigated in the second stage of the Birmingham University project on Soviet technology. To the present author it seems that the weaknesses are "systemic"—largely attributable to the lack of competitive pressures in the Soviet administrative economic system.

Comparative assessments of this kind are not straightforward. There is always some scope for differences in the interpretation of the evidence. In most areas there are some aspects of Soviet performance which are comparatively strong, and there are a few areas where Soviet overall performance seems as good as that of any Western country (e.g. high-voltage electric power transmission). But the conclusion of an overall lag is clear, and is supported, broadly speaking, by other studies using somewhat different approaches (e.g. Slama and Vogel 1975 and 1976). It is also reinforced by studies of sectors not covered in the Birmingham project (e.g. Campbell 1976).

More unexpected is the tentative finding of the Birmingham study that by and large the gap has not been narrowing. Studies by Michael Boretsky (Boretsky 1970 and 1973) reach apparently different conclusions. It is likely, however, that some or all of this apparent divergence is due to differences in the concepts of "technology level" that are being applied.

At all events, the situation which Soviet policy makers are trying to alter by international transfer is one in which they currently lag behind the West. There is nothing new about it. Russia has been trying to catch up by importing Western technology, as several writers have pointed out, at least since Peter the Great. Many observers, including the present author, believe, however, that the Soviet strategy has changed significantly in recent years. In the remainder of this section I shall consider first the timing and political significance of this change and then its significance for economic policy.

B. The Timing and Political Context of the Policy Change

The usual view is that at some point in the late 1960s there was a more or less abrupt shift towards greater emphasis on large-scale commercial imports of Western machinery and know-how: in other words, towards what I have termed "negotiable" technology transfer.

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Some writers have gone on to argue that this shift in trade policy was a major Soviet motive for seeking *détente* with the West.

Wiles, looking at Soviet leadership speeches and key foreign policy decisions, located a crucial change in Brezhnev's thinking somewhere in 1969–70 (Wiles 1976, pp. 1–5). Green and Levine place the turning point a few years earlier. They note a surge in Soviet machinery imports from the West in 1968–69 which is not well "explained" statistically within their econometric model (though such imports are well explained for earlier years). They conclude that this is the result of a major policy shift (Green and Levine 1976, included in the present volume). This conclusion would mean that the crucial policy decision was made in 1966–67. Both the time taken by negotiation with Western suppliers and the time from contract to delivery vary widely for machinery imports, but the modal figure for each of these two time lags is probably around a year. So it is reasonable to assume a two-year lag between a policy decision and the resulting machinery imports actually being shipped into the USSR.

My own view is that the change in Soviet policy is a more gradual one and can be traced back to the early 1960s. This view is based on a reading of Soviet specialist literature and of leadership speeches at Party Congresses, on machinery import data and on institutional changes such as the creation of a specialist foreign trade organization, *Litsenzintorg*, to deal in licences and know-how (1962) and the Soviet accession to the Paris Convention on the Protection of Industrial Property (1965). (Hanson 1975, pp. 19–23; on the Soviet accession to the Paris Convention see also Maggs and Jerz 1966.)

These disagreements about the dating of Soviet policy changes are not just academic quibbles. The precise date of the policy shift is not in itself important now, but our reading of how Soviet trade policy works is important. What decisions go to the Politburo? Which commercial policy decisions are seen as purely technical, and which are seen as requiring foreign policy decisions as well?

It seems plausible to say that the perception of a need for more direct, substantial and continuous infusion of Western technology became more widespread among Soviet planners and officials in the late 1950s and early 1960s. Kosygin, and possibly some other members of the leadership group, probably came to share this view well before the fall of Khrushchev. Some significant but narrowly technical decisions like the decision to set up Litsenzintorg were made at this early stage. Major developments such as the Fiat Tolyatti deal may have been made under discussion as early as 1962, with preliminary contacts between Kosygin and the Fiat President, Valletta, following between 1962 and 1965 (US House of Representatives . . . Sub-committee on International Trade, 1967, p. 4).

Accession to the Paris Convention (1965), the initial technological cooperation agreement with Fiat (1965) and the Tolyatti contract

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(1966) all come after the ousting of Khrushchev. They are all in some degree politically sensitive decisions. Even the apparently technical matter of acceding to the Paris Convention required various formal guarantees to foreigners (see below) which probably went against both the nationalist and the ideological grain. The Fiat agreements, at least, reflected top-level decisions in which Kosygin seems to have played a major role (Hardt and Holliday 1975, pp. 55–59). It may well be that only Kosygin's elevation to the premiership enabled those decisions to go through.

The surge in imports of Western machinery in 1969 is probably attributable to the Tolyatti deal, deliveries for which reached a peak in that year. Total purchase of Western machinery for Tolyatti totalled $550 million—spread over several years but in sum exceeding Soviet total imports of Western machinery in any year before 1968. All this could well have happened, however, with only the acquiescence, rather than the active support, of most Politburo members. It is quite consistent with Wiles' view that Brezhnev did not begin until slightly later to endorse the "Kosygin" view of the urgency of technology imports in general.

It might be argued, therefore, that the notion of a foreign policy deliberately tailored to promote such imports would not have been seriously considered by the Soviet leadership before 1969 or 1970. But this can only be a very tentative argument. It remains a matter of dispute whether any of the subsequent political developments—substantial Jewish emigration, SALT 1, and the agreement over Berlin—were primarily quid pro quo's for better trade relations with the United States.

C. Increased Role of Negotiable Transfer

The essence of the policy change is that emphasis has shifted from non-negotiable to negotiable channels of technology transfer from the West. This is primarily a shift in favour of embodied transfer, exemplified by machinery imports, and the commercial purchase of licences and know-how. Hardt and Holliday argue persuasively that there has also been a change to what they call the "modified systems approach" to international technology transfer. By this they mean a new emphasis on long-term or continuous links with Western suppliers, project-oriented industrial cooperation, the use of Western general contractors to oversee the installation of a whole complex system (from plant construction through to product distribution) and greater Western direct involvement in training and management (Hardt and Holliday 1975; see also Sushkov 1976).

The older style of limited machinery purchases plus a great deal of literature scanning, imitative development and reverse engineering, probably continues, if only because limited hard-currency supplies do not allow it to be entirely replaced by outright commercial purchase.

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It is simply that the emphasis seems to have changed. Reverse engineering is no doubt still heavily in use, for example, for products covered by the strategic embargo: these products can often be obtained by the Russians, but at high cost and usually in small quantities (Schneiderman 1976).

The motives for the change of strategy were clearly and publicly stated by Kosygin in the mid-1960s, notably in his report to the 23rd Party Congress. They have been repeated in a number of recent Soviet writings (e.g. Bogomolov 1974, Gorodisskii 1972, Naido and Simanovskii 1975, Vlaskin and Simanovskii 1975, Volynets-Russet 1973).

Non-negotiable transfer tends to require substantial domestic R & D and production inputs to reverse engineering to copy designs from Western literature, to modify and to introduce them into series production. The potential savings from outright purchase of whole plants, licences, etc., are enormous. (These savings are, of course, merely a particular example of the gains from trade). Once it was widely grasped by Soviet managers and planners that catching up with Western technology meant chasing a rapidly moving target over an ever-increasing product range, this shift in policy was almost inevitable.

It was probably hastened by a growing recognition that the Soviet administrative economy was much less effective than Western market economies in at least one crucial stage in the product cycle: the transfer from development or prototype work to commercial production. In Soviet publications this last point is normally only made indirectly, but the implication is usually clear and does not seem to be treated among specialists as controversial. (See, e.g. Naido and Simanovskii 1975, p. 69, where they refer to the "development-assimilation-production cycle" being "rather protracted (*dlitel'nyi*) for our countries" (CMEA).)

D. Balance of Payments Aspects

The Soviet hard-currency balance of payments sets limits to the translation of those perceptions into policy. It appears, though, that at some point in the recent past a decision was taken to make more active use of Western credit and allow a rather higher hard-currency debt-service ratio to result. 1971–72 may well be the turning point in this respect.[3] Looking at Soviet hard-currency imports of machinery from the West (roughly, OECD less Finland) between the mid-1950s and the early 1970s, I found that for 1955–71 the simple hypothesis that machinery imports in any given year (MK_t) were determined by total exports to the west in that year (X_t) and (negatively) by grain imports from the West in the previous year (MG_{t-1}), fitted the facts remarkably well.

[3] Green and Levine locate this point somewhat earlier, in 1968–69, but the disagreement over the date is less important than the agreement that such a change occurred.

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$$MK_t = -72{\cdot}42 + 0{\cdot}386\,X_t - 0{\cdot}394\,MG_{t-1} \quad (R^2 = 0{\cdot}916)$$
$$(0{\cdot}934) \quad (8{\cdot}086) \quad (-2{\cdot}502)$$

(The bracketed figures under the coefficients are t statistics, and the X_t and MG_{t-1} coefficients are both significant at the 1 per cent level.) Even if the time trend is removed from X and MK, the relationship over 1955–71 is still quite strong. The implication is that variations in indebtedness to the West, or in gold sales, are not strongly associated with variations in machinery imports in this period.

In 1972 the pattern changed. The US-Soviet trade agreement offered a major new source of credit, and emergency grain imports (on credit) were made while (unlike 1963–64) machinery orders and deliveries continued sharply upwards. (See Hanson 1975.)

Greater use of credit was no doubt in part a response to the acceleration of Western inflation, which provided the Russians with credit at negative real interest rates. But, taken in conjunction with the other changes considered, it is surely also part of the more general policy change under discussion.

The Impact of International Transfer on the Soviet Economy

A. Considered Forms of Transfer

I shall focus here on negotiable transfer because there is not very much that Western governments can do in normal times about non-negotiable transfer.

Within the sphere of negotiable transfer I shall concentrate on machinery and know-how trade, including Soviet decision-making procedures in these areas. Scientific and technological cooperation agreements with Western firms and governments could also become important for the Soviet economy but there is no clear evidence that they have yet had much effect on production. The agreements between Western firms and the State Committee for Science and Technology seem to be important mostly in providing firms with an *entrée* for negotiating product and know-how sales. The inter-governmental agreements are mostly of a kind whose economic consequences, if any, will be rather long-run (Graham 1974).

B. Machinery Imports

Table 1 shows the growth of aggregate machinery (SITC 7) imports from the West since 1965 and their relationship to Soviet investment. The machinery import figures come from Western (OECD and US Department of Commerce) sources. Purchases from Finland are excluded on the ground that Finland's special relationship and soft-currency settlements with the USSR make it a non-Western country so far as the politics of East-West trade are concerned.

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TABLE 1

Soviet Imports of Western Machinery and Transport Equipment 1955–1975

Column 1: Imports of Western machinery US $m. f.o.b. current prices.
Column 2: Machinery imports at "1969 estimate" prices, m. rubles. (Conversion into rubles on the basis of Boretsky 1964 machinery conversion rate, adjusting for intra-Western price differences and inflation.)
Column 3: Machinery imports as per cent of domestic machinery investment of the following year.
Column 4: Imports adjusted for a machinery conversion rate twice as favourable to the dollar.

	1	*2*	*3*	*4*
1955	104	74·0	1·0	2·0
1956	139	93·9	1·2	2·4
1957	128	82·8	0·9	1·8
1958	123	79·0	0·8	1·6
1959	177	113·6	1·1	2·2
1960	310	196·3	1·7	3·4
1961	390	236·1	1·8	3·6
1962	436	255·2	1·8	3·6
1963	402	233·7	1·4	2·8
1964	489	280·7	1·6	3·2
1965	366	210·3	1·1	2·2
1966	395	218·2	1·1	2·2
1967	457	249·6	1·2	2·4
1968	639	360·7	1·6	3·2
1969	889	482·9	1·9	3·8
1970	905	456·6	1·7	3·4
1971	840	398·1	1·4	2·8
1972	1113	473·6	1·5	3·0
1973	1566	543·0	1·6	3·2
1974	2100	660·0 [2]	1·7	3·4
1975	(4000) [1]	(1044) [2]	(2·4) [3]	(4·8) [3]

[1] Author's rough estimate on the basis of incomplete OECD data.
[2] Accepting the CIA estimate of a 10 per cent increase in average prices in 1974 over 1973 and assuming (arbitrarily) a 20 per cent increase in 1975.
[3] Related to Plan 1976 machinery and equipment investment. The latter has been reported in 1973 prices and is converted here to 42·7 bn. rubles in 1969 prices. The Column 4 conversion rate for 1975 is $1·6 = 1 ruble.

Sources
Hanson 1975, p. 31; updated through 1974 and 1975 using recent OECD and *Narkhoz* data; CIA, *Recent Developments in Soviet Hard-Currency Trade*. Jan. 1976; *Pravda*, 3 Dec. 1975, and 1 Feb. 1976; and *Planovoe khozyaistvo*, 1976, No. 1, p. 48.

Notes on Methods
The methods used in compiling Table 1 are explained in full in the first source cited. For present purposes it is sufficient to note that a price index for these machinery imports was constructed on the basis, primarily, of domestic wholesale machinery price

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The main implications are apparent in Table 1. First, Soviet imports of machinery and transport equipment have been a small ingredient in the Soviet investment programme. Secondly, their contribution to Soviet investment has increased only modestly in the past 20 years.

The first conclusion holds whether or not we consider the percentages in column 4 to be more "realistic" than those in column 3. My own view is that enough is known about the defects of Soviet civilian machinery in quality, reliability and durability (for machines with specifications equal to those of Western machines) to cast doubt on the column 3 conversion rate and make column 4 more plausible (Hanson 1975; Hill 1970 and 1973). The Green-Levine estimates employ machinery ruble-dollar conversion rates close to those in column A. Thus they employ a conversion rate of \$0.79 = 1 domestic ruble for 1966, while column 4 employs a rate of \$0.87 = 1 ruble for 1964.

The question of which rate is "realistic" is separate from the question of the conversion rates at which imported machinery is actually priced into the accounts of Soviet enterprises. High-level planners appear to feel that these latter rates tend to be too low and should be raised (Zakharov and Sulyagin 1974). For the early 1970s, Soviet official statistics appear to use conversion rates of the order of those used in column 4, at any rate for aggregate recording purposes; this is implied by the attribution of about 5 per cent of industrial equipment investment in the early 1970s to Western sources (*Planovoe khozyaistvo*, 1974, No. 12, p. 31). But in any case, the share of Western equipment is small. The share of imported machinery (excluding cars) from other Western countries in US equipment investment in 1970–71 was about 11 per cent. The share in the early 1970s in the Soviet case is, strikingly, fairly close to the share of imported Western machinery in equipment investment in the same period in the People's Republic of China (Dernberger 1975).

The second conclusion reached from the table, that the share of imported Western machinery has risen very little, needs to be modified. The figures in columns 3 and 4 are calculated on the assumption that Soviet official "constant price" investment series really are constant. There is abundant evidence that in fact they contain an element of price inflation. Becker's assessment suggests that the figures for the later years in columns 3 and 4 should on this account be raised somewhat (Becker 1974). A plausible adjustment of the column 3 series might put the 1970 figure at 4 per cent and the 1975 figure between 5·5

indexes for the supplier countries and using weights reflecting the supplier countries' share in total Soviet machinery imports from the West. These weights were altered to reflect changes in country shares, the weight changing as between 1955–59, 1965–70, and 1971–73. (1974 and 1975 price changes were assessed *ad hoc*, as indicated in the notes to the table.) The conversion rates in Column 3 pivot on a Boretsky conversion rate between 1964 US engineering products prices and Soviet 1955 prices (Boretsky 1970). This is adjusted both for machinery price differences between the USA and other Western suppliers in 1964 and for Soviet 1955–69 price differences.

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and 6·0. This makes the increase since the mid-1950s look a little more consequential but it is still hardly a dramatic rise.

It seems clear from these figures that the aggregate, direct impact of this embodied technology from the West cannot, even in the mid-1970s, constitute a dominant source of aggregate Soviet economic growth. The direct effect of imported machinery would be the flow of output from it, net of the cost of cooperating inputs. This can certainly be expected to be greater than would be obtained from domestically-produced machinery of similar domestic-ruble value. The direct effect of the superior technology embodied in imported machinery would be approximately equal to the difference between these two flows of output. That there normally is such a difference can hardly be doubted. Foreign currency is only allocated for imported machinery if the application for it is backed by statements from the relevant Soviet machine-building ministry that it cannot itself supply machinery of equal quality (and sufficient quantity) in the period required (*Metodicheskie ukazaniya* 1974, p. 595). Still, the productivity of imported Western machines can hardly be so much greater than that of domestic (or East European) machinery that a mere 5 per cent ingredient of such imports can produce a very large share of the increase in output attributable to new machinery.

Moreover, any invigorating effects on Soviet GNP growth that the modest increase in the Western machinery share may have had (following Gomulka's analysis) over the past 20 years, seems to have been swamped by factors working in the other direction. Soviet economic growth over this period has, after all, tended on the whole to decelerate, not accelerate.

Does it follow that the whole business of embodied transfer from the West has been given an exaggerated importance? Not necessarily. The figures in Table 1 are certainly a salutary reminder that the flows of Western machinery into the Soviet Union are trivial in size beside the other inputs into that vast economy. (This would not be the case for the smaller East European economies.) But their indirect effects and their impact on particular industries, could nonetheless be considerable.

C. The Indirect Impact of Machinery Imports

Let us take the question of indirect impact first. This would presumably consist of (a) productivity increase attributable to new materials, components and machines produced on the imported machinery; (b) new and improved Soviet built machinery embodying some or all of the new technology incorporated in the original imported machines, and (c) feed-back effects on the technical level of Soviet material and component suppliers for an imported plant—these would be pressures for change rather than direct contributions to it.

It is likely that in an economy as large as that of the Soviet Union

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the greatest potential for indirect gains from imported hardware comes from the second of these three effects, namely, diffusion. This is one of the fields of Soviet endeavour in which statements of intent abound but clear-cut examples of implementation are not easy to trace. Campbell refers to plans, whose execution does not seem to have been reported, to produce 10 off-shore oil drilling rigs for the Caspian, designed on the lines of an imported Dutch rig (Campbell 1976, p. 19). The present author has quoted references to what appears to be an imported complex granular fertilizer plant which came on stream in Vinnitsa in 1968; statements that this was a pilot plant to be followed shortly by two scaled-up (and apparently domestically-built) plants of the same type were made at the time, though the subsequent comletion of these plants does not appear to have been reported (Hanson 1976 (b)).

The whole question of diffusion is of vital importance and will be taken up again at the end of this section. Let us first, however, consider overall indirect impact. Clearly, this could be a great deal larger than the direct production gains alone from imported hardware.

Green and Levine have provided an estimate of the total (direct plus indirect) contribution of imported Western machinery to Soviet production in recent years (Green and Levine 1976). (A slightly earlier paper by Green and Jarsulic (1975) presents some closely related estimates. These will not be discussed separately here.) They have done this by constructing a separate annual capital stock series (in 1955 rubles) for imported Western capital equivalent in use in Soviet industry (and also in the chemicals and petrochemicals branch alone) over the period 1960–74. They then estimate a Cobb-Douglas production function with labour, domestically produced (plus East European) capital stock, and imported Western capital stock as the inputs, and obtain separate measures of the output elasticity (marginal productivity) of domestic and "Western" capital stocks.

The estimates, as the authors note, are based on a number of debatable assumptions, quite apart from the doubts that surround the procedures of production function estimation as such. The "Western" capital stock series is derived from import data; the assumptions made about the initial stock, conversion in 1955 rubles and retirement rates could all be queried. The results, however, do not appear to be very sensitive to changes in these assumptions.

The key estimate of the Green-Levine paper, however, is the marginal productivity of the stock of imported Western capital goods in Soviet industry. This comes out very high: eight to 14 times the marginal productivity of the rest of the industrial capital stock (Green and Levine 1976, Table A-1), calculated over the period 1960–74.

This is, to repeat, a measure of direct plus indirect impact. It enables the authors, using their econometric model of the Soviet economy, to test for the effects of hypothetical changes in the rate of Soviet import

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of Western machinery. One such calculation is a " retrospective repeal of *détente* " in 1968–73. Here the shift in import policy ascribed to 1968–69 is taken out. Machinery imports from the West trace out a somewhat lower path than was actually observed. In consequence, the 1973 stock of imported Western capital goods installed in Soviet industry is reduced by about 16 per cent, with the result that Soviet industrial production grows (hypothetically) by only 29·6 per cent between 1968 and 1973 instead of the 32·1 per cent actually observed. The effect on GNP growth is of necessity proportionally smaller: from an actual percentage increase of 28·7 per cent to a hypothetical 27·6 per cent (Green and Levine 1976, Table 4).

These are striking results. They suggest that the indirect impact of imported Western machinery is quite large. It should be made clear at once that the authors treat these estimates as experimental and illustrative only. It should equally be noted, however, that the estimates just discussed represent a revised (and somewhat reduced) estimate of the impact of Western machinery and are not a " first approximation."

The authors point to some serious problems of interpretation. One is that the scale of machinery imports is so small. The projects for which Western machinery is imported should therefore be the top candidates in the planners' lists of such projects: if correctly selected, they will be precisely those projects in which the marginal productivity (direct plus indirect) of imported capital goods is highest. An increased share of imported Western machinery would be associated with a less striking disparity between the marginal productivity of imported Western and domestically produced capital goods. Indeed the import share is so small that this disparity might fall very sharply as the share was raised.

A second difficulty about the interpretation of these estimates is that the indirect impact of the imported hardware is of course achieved by a combination of the imported technology with domestic resources: e.g. R & D and production inputs to replicate (diffuse) imported plant. The imported technology is a necessary but not sufficient condition of these indirect gains and should not be credited with all of them. The estimates of the function of production simply report a statistical association between imported capital goods and output. This must of course be carefully interpreted so far as hypotheses about causation are concerned.

In the absence of these machinery imports, substantial domestic resources would probably be released from utilization and diffusion of the imported technology and could be re-allocated to indigenous innovation and diffusion (and the diffusion of disembodied technology transfer from abroad). The results might substantially offset the losses from the absence of embodied transfer. On this account, then, one must be cautious in interpreting these estimates. A " true " estimate of

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the net effect of the imported capital goods alone might well be considerably smaller.

A third difficulty concerns the lag of one year which Green and Levine posit between machinery import and machinery installation. They rightly point out that information to support a different lag is lacking; in the absence of such information their choice of one year is based on the fact that a lag of one year gives the best statistical fit between output and capital goods imports. On the other hand there are several reasons for suspecting that the "average" lag is likely to be longer than this. There are many reports of much longer installation delays in major projects (though not necessarily for equipment installed in an already-operating production unit). More significantly, it is hardly conceivable that the indirect effects of imported machinery would be at their peak on or immediately after installation of the machinery—and indirect impact is likely to outweigh the direct impact.

At all events, the Green-Levine calculations raise some crucial questions. Do we really believe that the total impact of recent technology transfer from the West is as large as they indicate? If it is, the implication is that indirect impact is substantial. Is that likely? On intuitive grounds, and from anecdotal evidence, one is inclined to be sceptical. Is the cumbersome Soviet administrative system really so much better, for example, at diffusing technology embodied in imports than in diffusing technology derived in other ways? On the other hand a recent case-study by the present author tends to support the view that the impact may be quite large. This topic will be taken up again in section F below.

D. The Sectoral Impact of Machinery Imports

The other question to be asked about imports of Western machinery is what their impact has been on particular branches of the Soviet economy. Using Soviet trade data, which are more helpful here than Western data for identifying machinery imports, I have compared shares in imports of Western machinery with branch shares in total "productive investment" in the Soviet economy in 1955–56, 1960–61, 1965–66 and 1970–71 (Hanson 1975, pp. 37–40). If the former share exceeds the latter, there is prima facie evidence that the branch made above average use of embodied Western technology, and was (in a relative sense) "dependent" on it. If the latter share exceeds the former, the branch is relatively "independent."

This method of assessment is crude, and it can only be carried out for a limited number of fairly broadly defined Soviet industries. It does, however, produce a plausible general picture in coal-mining, iron and steel, the oil industry, building materials, agriculture, electric power supply and food processing which were all relatively independent throughout.

Light industry, timber, paper and pulp, and shipping were con-

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sistently "dependent." The chemical industry was heavily dependent except in 1955–56. The machine-building and metal working sectors looked relatively dependent in the first and last periods but not in the two intermediate periods. In addition we can be quite sure that if more disaggregated investment and trade data were available, computers and motor-vehicles would emerge as relatively dependent industries since the early 1960s. (Computers considered as a type of imported machine, not computer-production as a branch-user of imported machinery.)

From this it can be concluded that chemicals, computers, shipping, the motor industry, timber, paper and pulp, and light industry are branches in which imports of Western machinery have been concentrated. The chemical industry is probably the outstanding example. Western machinery probably accounted for around 30 per cent of its equipment investment programme in the 1960s, during the belated modernization drive stemming from Khrushchev's "chemicalization" campaign. In most of the more advanced branches of the chemical industry the role of imported machinery remains predominant. In 1973, 74 per cent of Soviet complex fertilizer production, 50 per cent of ammonia, 62 per cent of urea and 84 per cent of high-pressure polyethylene output came from imported (Western, rather than East European) equipment (Luk'yanov 1974).

On the other hand, the upgrading of a previously neglected industry does not guarantee that imported Western machinery will be concentrated on it. This has not happened in the cases of food-processing or agriculture. The explanation may be that these are not research intensive industries; greater indigenous effort plus the use of East European machinery and know-how may have been judged adequate.

Nor does an above-average use of Western machinery guarantee an above-average rate of factor productivity growth (Desai 1974; Hanson 1975). It does emerge, however, that the industry whose measured rate of "technical progress" in 1955–71 stands out in Desai's estimates is also the industry whose usage of Western machinery stands out: the chemical industry. This suggests two plausible conclusions. First, a high (and sharply increasing) usage of Western machinery can produce very rapid improvement in a particular branch. Secondly, the overall level of machinery imports has not been high enough to allow this influence to dominate other influences on productivity change in more than a very few branches.

Campbell's study of the energy sector suggests comparable conclusions (Campbell 1976). He contrasts the technological performance (relative to the USA) of the coal and electric power industries: both have been relatively independent of international transfer (at least in the form of machinery imports), but the coal industry has performed poorly and electricity supply relatively well. The explanation, he suggests, lies in their differing organizational structures and hence their differing reflections of the innovational strengths and weaknesses of

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the Soviet system. In other words, these branches, too, illustrate the importance for Soviet technological performance of influences other than embodied transfer from the West.

E. Imports of Licences and "Know-How"

None of this discussion deals with the other major form of negotiable transfer: licence and know-how trade, including training. Here basic data are sparse. Most Western governments do not systematically record such sales by country of destination. The Soviet government may have reasonably reliable figures for Soviet purchases, but it does not report them.

Indeed, it may even be doubted if the Soviet authorities have reliable information. Many licence deals and know-how transfers are included in "package deals" along with machinery (e.g. in turn-key projects). The details of these packages, such as the tags put on know-how, may be juggled with for negotiating purposes so that the value figures in the accounts of Soviet foreign trade organizations (f.t.o.'s) may be misleading.

Litsenzintorg, the specialist f.t.o. dealing with licences, handles "pure" licence and know-how trade, i.e. transactions in which other ingredients are minimal. Licence and know-how sales under package deals with other f.t.o.'s may not be separately reported to the Central Statistical Administration or the Ministry of Foreign Trade. The figures for numbers of licence transactions occasionally reported in the Soviet press, e.g. 120 new products and processes assimilated into production in "the past eight years" on the basis of licence purchases (*Pravda*, 12 March 1974), almost certainly refer only to licences bought by Litsenzintorg. The judgment of well-informed Western practitioners in this field is that the total number of licences sold would be much higher.[4] Such evidence as there is suggests that total CMEA annual expenditure on licences and know-how in the early 1970s may have been equivalent to around 5 per cent of the value of machinery purchases from the West. This would not be dissimilar to the ratio in world trade generally. One difficulty is to know what share in the total is formed by intra-CMEA licence payments. These are probably minor but have existed since the late 1960s, when the system of free exchange of technical information within CMEA broke down (Campbell 1969).

Of the CMEA countries, the USSR is certainly a less active user of licences than some other countries either in product payback deals (ECE 1973 and 1975) or in total (Vlaskin and Simanovskii 1975). On the export side, Litsenzintorg has sold a number of licences in the West for Soviet patented processes, mainly in the metallurgical field (Kiser 1976). It is nonetheless reasonably clear that Soviet licence and

[4] I am indebted to Mr. David Winter for this information.

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know-how trade with the West shows a strong negative balance in value terms. For CMEA as a whole we have Wilczynski's estimates that payments to the West exceeded receipts eleven-fold in the 1960s and about four-fold in 1970 (Wilczynski 1974, p. 308, citing a DDR source). For an unspecified date, probably in the early 1970s, and again for CMEA as a whole, a ratio of payments to receipts of about 12:1 is implied by a Soviet source (Naido and Simanovskii 1975, pp. 67–68). It is unlikely that the picture would be markedly more favourable for the USSR than for CMEA as a whole. Various scattered pieces of information on the value of CMEA licence transactions are assembled in Table 2.

The available evidence suggests that Soviet licence-purchasing is still on a small scale compared to that of medium-developed Western economies. The implied total annual expenditure on licences for CMEA as a whole, in the article by Naido and Simanovskii just cited, is of the order of $360 million. This may be compared to a figure of $346 million for receipts by US firms alone from licence agreements with affiliated and unaffiliated companies in Japan in 1972 (Wilson n.d.). The Soviet figure will of course be far below the CMEA total, in which Czechoslovakia alone may well have accounted for around $200 million (Vlaskin and Simanovskii 1975). All this evidence is however a bit shaky because the figures are only inferred from the Soviet texts, and the extent to which they would cover licences and know-how bought under package deals is not clear.

At all events, Soviet licence purchases have risen sharply since Soviet accession to the Paris Convention on the Protection of Industrial Property in 1965. This step probably reflects a Soviet decision that there is more to be gained by offering some patent protection in the USSR to foreign patentees and encouraging them to sell licences than by persisting with the devious and costly practice of unlicenced (but legally immune) copying.

It does not follow, as is sometimes suggested, that a top-level decision was taken to cease all unlicenced copying. However, there seems to be a consensus among Western businessmen that the Russians do generally play the game according to the rules, and formal channels exist for foreign licensers to take action in Soviet courts (Debelius 1975). It may be noted nonetheless that the 1973 *polozhenie* on patents includes, probably for emergency use, a provision (Point 35) that the USSR Council of Ministers may authorize purchase and use (i.e. use and make a unilaterally-determined payment for) a patent covering an invention of special importance to the Soviet government which the patentee refuses to licence (Shatrov 1975, p. 10).

For our purposes it is obviously important to know how effectively the licences are worked. From reported anecdotal evidence there appears to be considerable inefficiency in the use of licences, though this may be partly because the planning system is still adapting to this

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new technique; licence purchases were not included in annual or five-year plans until 1971 (Volynets-Russet 1973, p. 129).

There are several instances of difficulties over the use of licences. The Russians took longer than any other of 16 licensees of the Pilkington float-glass process (up to May 1970) to go from licence purchase to production (G. F. Ray in Nabseth and Ray 1974, p. 205). They took 41 months compared with an average of 27 months for all the licensees over that period and a best time of 15 months (by a Japanese company). Construction delays prevented the use within the term of the licence deal of a licence to manufacture disc brakes (*Pravda*, 12 March 1974). The fact that the early (1959) purchase of the Burmeister og Wain marine diesel engine licence remains the standard success story in the Soviet literature is intriguing; does it mean that other successes are few and far between, or is it simply that the flow of information is so restricted in Soviet society that journalists and economists writing on the subject have to make do with one approved and publicized example?

The planning procedures that are supposed to be followed show the familiar concern to limit hard-currency expenditure to imports of new technology. The vetting of applications to buy licences and the planning of their purchase and use is a joint responsibility of USSR Gosplan and the State Committee for Science and Technology. An interesting business game for Soviet managers in the leading Soviet management journal suggests that the achievement of a foreign currency earning capacity will often be a criterion even at the ministry or enterprise level and that licencing deals with restrictive exports clauses may on this account sometimes be avoided ("*Chto vygodnee*: . . .? " 1974).

Production planned under the licence must be shown to cost at least one third less (for a given volume of output) than production based on domestic R & D. The cost comparison is in present-value terms using a discount rate of 8 per cent. Conversion of foreign exchange costs from foreign to domestic currency is at shadow, not official, exchange rates. Production is supposed to start not less than two years from the licence purchase (*Metodicheskie ukazaniya* 1974, pp. 9, 12 and 17–20; Volynets-Russet 1973). The extent to which these procedures are adhered to and, more generally, the overall impact of Soviet licence and know-how purchases seem quite impossible to assess from available information.

F. Diffusion

The Soviet capacity to diffuse foreign technology within the domestic economy has come up repeatedly in our discussion of both machinery and imports of know-how. It is inherently likely that, in an economy so large in relation to foreign trade flows, this capacity is of crucial importance to the total impact of international technology transfer.

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TABLE 2

The Value of CMEA Licence Transactions with the Developed West—Some Estimates ($m.)

Country or group of Countries	Time Period	Revenue from West	Payments to West	Sources and Comments
Czechoslovakia	1968–1972	51	c. 200	G. A. Vlaskin and S. Simanovskii, " Litsonzionnaya praktika v ChSSR " *Voprosy izobretatel'stva*, 1975, No. 2, pp. 57–61. Revenue figures given in source; payments " recently " said to be " about four times " the value of receipts.
Hungary	1968–1971	1·52	9·38	UN ECE E/ECE/844, Addendum 1, p. 9.
Poland	1970		" about 3 times receipts "	Ibid., p. 8.
total CMEA	1960–1969		" 11·2 times receipts "	J. Wilczynski, *Technology in Comecon*, p. 308, citing DDR source.
total CMEA	1970		" 4·0 times receipts "	Ibid.

total CMEA	? early 1970s Approximate annual averages	30	(360)	Yu. Naido and S. Simanoskii, "Uchastie stran SEVa v mirovoi torgovle litsenzii," *Voprosy ekonomiki*, 1975, No. 3, pp. 67–77. " Current " (no date) annual revenue figure from p. 67, where it is stated to be about 1% of total world licence trade excluding (p. 68) intra-CMEA trade. Total East-West licence trade put (p. 68) at about 10 per cent of world total including the notional value of intra-CMEA licence exchanges (period not specified), which is put at 24 per cent of world total including intra-CMEA. Hence (apparently) payments to West = about $(10 - \frac{76}{100})$ times $\frac{100}{76}$ times receipts, or about 12 times receipts.
USSR and Eastern Europe with UK only (incomplete)	1972	0·2	5·9	International Business Unit, Dept. of Management Studies, UMIST (private communication). Data are derived from a sample survey of UK firms. They cover " technological and mineral royalties " excluding licence receipts on whole-plant deals which were not separately reported.

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Micro-economic evidence suggests that Soviet domestic diffusion of imported technology is likely to be inefficient by Western standards. I have discussed the grounds for expecting this in another paper (Hanson 1976 (a)). They are briefly as follows.

First of all, there are the well-known institutional hindrances to innovation and diffusion generally in the Soviet system: the institutional separation of research from production; the lack of incentives for producers to alter the product-mix; problems of new-product pricing; the inhibiting influence of low depreciation rates.

Then there are problems in the diffusion of technical information, a process which must precede the diffusion of the new products and processes themselves but which appears in Western Europe to proceed at about the same speed (between firms) as subsequent process innovation (Nabseth and Ray 1974, p. 300). In the USSR there has been sharp criticism of many technical information services, such as the All-Union Institute of Inter-branch Information (VIMI) (Artamonov 1975). Another and more technical hindrance to the spread of information is the scarcity of photo-copying and microfilm equipment. Tracing paper and Indian ink are still used for most design copying in Soviet industry (*Pravda*, 3 January 1975).

A former Soviet scientist now in Israel, Professor M. Perakh, has provided some striking insights into some of these problems (Perakh 1976). He stresses the importance of information barriers, both against the outside world and between Soviet institutions. He points to three particularly interesting motives for such barriers between Soviet institutions: fear of disclosing to other Soviet citizens the lag behind the West in one's own particular field; fear (on the part of scientists and technologists) of the "uneducated rulers," and the desire to hide the widespread illicit use of foreign patents and other know-how (Perakh, p. 10).

This last motive is connected with a mechanism which in Perakh's experience is of some importance in Soviet research. He states that Soviet scientists often use Western patent or other data as a basis for research proposals without disclosing this fact to fund-giving bodies or their own superior authorities. "The original patent (or other sources of information) is generally not mentioned, as if the idea were his own and was worked out in his laboratory" (Perakh, p. 8). The research then replicates results already achieved in the West without superior authorities or potential Soviet users of the research being aware of this fact.

In so far as this happens, it presumably leads to the formation of groups in the scientific and technological community with a vested interest in halting or slowing both the introduction and diffusion of foreign technological information which would expose or render futile their own activities. The phenomenon is probably not peculiar to the Soviet system—it sounds not unlike the NIH (Not Invented Here)

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syndrome in British industry—but it will surely be encouraged by the closed, bureaucratic and rather uncompetitive nature of Soviet society.

In the last resort the lack of competitive pressure in the Soviet economic system is probably the most powerful underlying reason to expect a lack of technological dynamism. That there is, on the whole, a lack of such dynamism is suggested by the case-studies of Soviet technology referred to earlier (notably Sutton 1973; Amann 1976; Slama and Vogel 1975 and 1976).

Many of the above arguments, however, apply to Soviet technical change generally. Is it not possible that the diffusion of imported technology (in the sense of negotiable transfer) is an activity that is carried out much more efficiently in the USSR than innovation and diffusion of indigenous technology or technology transferred from abroad by non-negotiable channels? A study of the Soviet chemical industry, for example, shows several cases of indigenous innovations which stalled at the pilot-plant stage and were then replaced by close-substitute imported products and processes, which were then diffused (Amann 1974). A markedly better performance in diffusing embodied technology imports than in diffusing other technology of different origins might account for the Green-Levine findings discussed above—as the authors themselves suggest.

Here it is important to introduce a consideration that goes against much of what has just been said about the Soviet system's lack of technological dynamism. This is pressure from above. Campaigns, initiated at Politburo level, to deal with particular problems, are themselves part of the Soviet system. To a considerable extent they must counter its tendencies to stagnation and inefficiency in routine operation. Pressure from above cannot, by definition, be universally applied, and will typically incur costs because of its disruption of those activities that are not the subject of the campaign. But it is probably an important reason why a lot of things do in the end get tolerably well done in the Soviet Union. The weaknesses of the " system " in normal or routine operation are in some degree misleading about its overall performance.

Perhaps pressure from above can and does facilitate the diffusion of imported technologies. After all, technologies imported via negotiable transfer have by definition been considered important enough to have substantial amounts of scarce hard currency spent on them. It seems plausible that special effort would subsequently be devoted to diffusing them. Furthermore, such special attention would not be impracticable in view of the relatively small scale of negotiable transfer from the West.

The Green-Levine macro-economic evidence supports the idea of especially effective diffusion in the case of technology embodied in imported hardware. Sutton's case studies also support it, though with this difference, that Sutton stresses Soviet efficiency in reverse engineer-

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ing and scaling-up from single Western machines treated as prototypes (Sutton 1973). These are activities which I would classify as diffusion from non-negotiable transfer. But they involve skills and procedures broadly applicable to the diffusion of technology imported in the form of whole plants, large machinery orders or licences and know-how. So perhaps Sutton's evidence, too, favours the view that Soviet diffusion of technology transferred via negotiable channels is relatively efficient—compared at least to the diffusion of indigenous technology.

On the other hand, there are certainly cases where the planners have aimed at diffusing imported technology but implementation has either been slow or has failed entirely. Some instances were quoted above of slow utilization of licences (which is itself a form of diffusion). Apparent failures or delays in replicating imported foreign oil rigs and complex fertilizer plants have also been mentioned.

I have recently completed a case study in which I have tried to assess the total (direct plus indirect) impact of mineral fertilizer technology (Hanson 1976 (b)). This suggests that there has been at least some success in the Soviet diffusion of imported technology in the production of urea, phosphoric acid and complex fertilizers between 1960 and 1975.

In the case of complex fertilizers, there was no Soviet production at all in 1960. In the early 1960s plants to manufacture complex fertilizers began to be imported. Production rose to around 13 m. tons in 1975 (still a small share of total mineral fertilizer output by Western standards). By 1973 some 26 per cent of complex fertilizer output was reportedly being produced from domestically-built plants (Luk'yanov 1974), and this may have risen to about 34 per cent by 1974 (Hanson 1976 (b)). Much of the " indigenous " output, however, was mono-ammonium phosphate (MAP), which can be made rather simply from low-grade phosphate rock and is not normally suitable for direct use as fertilizer, without further processing. In 1976 Soviet officials were nonetheless making inquiries about further supply of complex fertilizer plant. Whether this is or is not a " good " performance in diffusion is hard to say. Comparison with other countries and/or expert evaluation is required. On the face of it, though, it does not appear to be an example of rapid success in diffusion.

A final example is provided by the Tolyatti plant. This has apparently exerted pressure on the technology of Soviet suppliers of components and material for the Tolyatti complex by raising quality and performance requirements (the feedback type of indirect effect mentioned earlier). This pressure appears to have produced some substantial improvements (Hanson 1976 (a)).

Diffusion from Tolyatti, however, seems to be more problematic. A recent Soviet article on the Tolyatti complex raised some extremely interesting questions on the score (Golland 1976). The author is concerned both about the maintenance of " contemporary " levels of

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technology at the VAZ works itself and about the diffusion (*raspros-tranenie*) to other Soviet factories of the still relatively advanced technology which VAZ incorporates. He mentions a number of recent developments in motor industry technology, such as higher-speed spraying, which have not been adopted at Tolyatti. Reconstruction and modernization are in his view necessary.

Golland argues that technology embodied in the VAZ works is not being diffused sufficiently to other factories. " . . . Leading experience, even such as that of VAZ, will not diffuse by itself " (Golland, p. 81). A special system for diffusing VAZ technology should be created. He links this with the issue of the modernization of VAZ itself as part of the general need to maintain VAZ as a centre of technical excellence and keep up the morale of its staff.

The basic options in the re-equipping of VAZ, he says, are a renewed large-scale purchase of foreign machinery and licences or the creation of a domestic machine-building sector capable of supplying motor-industry machinery of contemporary technological standard. Since 70 per cent by value of the equipment installed at VAZ is imported (Golland, p. 85), the dilemma is acute. The author clearly sees the present situation as one in which the technology installed at Tolyatti is being neither substantially updated nor widely diffused.

This evidence may be anecdotal, but the preceding information covers some $550m. of imported Western machinery (at late 1960s prices) and a factory complex responsible for the assembly (and much of the subassembly and component manufacture) of 55 per cent of the current output of Soviet passenger cars.

Such evidence suggests to me that we should be very cautious about the Soviet capacity to diffuse imported technology. The subject is one that deserves further investigation by means of both case studies and further econometric work. At present, I am sceptical about Soviet performance in this area. In any event, there seem to be strong *a priori* reasons to expect that performance in diffusion would tend to become relatively less good as the volume of imported technology increased relative to domestic production: the limited resources available for " pressure from above " would have to cover a great number of products and processes.

More generally, if pressure from above is a major source of technical change in the Soviet economy, the ability of top policy makers to see key technological developments early and act swiftly to exploit them is important. There is room for a good deal of scepticism about Soviet performance in this respect too. Both semi-independent Soviet domestic development and Soviet import of major new technologies tend to start late: computers, plastics and synthetic fibres are all clear examples. To take a technology of narrower importance: the Soviet purchase of a Pilkington float glass licence, mentioned above, was not made until 1967, well after many Western firms had bought it.

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Finally, the Tolyatti example just discussed raises the question of capacity not merely to diffuse an imported technology but to update it by indigenous effort and perhaps even to move ahead of other countries by independent adaptation or the independent development of radically new technologies. This is ultimately what "catching up and overtaking" is, in large part, about, and it will be considered in the final section.

Conclusions and Suggestions for Further Research

We have seen that the import of Western technology by negotiable channels—principally machinery and licence purchases—remains small and has not increased dramatically relative to Soviet domestic investment. It is concentrated on relatively few industries and has had a major impact on the growth of some of them.

Its total impact on Soviet economic performance remains uncertain. Some macro-economic calculations suggest that the total impact in recent years may have been substantial. Anecdotal evidence tends to raise doubts on this score, indicating that diffusion is likely to be slow by Western standards. The degree of success in diffusing imported technology is likely to be very important in determining whether, in the Soviet case, the total impact of negotiable transfer on Soviet growth is or is not large. The evidence is that some successful diffusion occurs, but it is doubtful whether Soviet diffusion is generally very effective. It is arguable, further, that diffusion would tend to become less effective, on the whole, if the rate of direct technology import were to rise substantially.

The case study of mineral fertilizer plant, referred to earlier (Hanson 1976 (b)), suggests that in at least some cases total direct-plus-indirect impact may be large, despite rather slow and limited diffusion. On the basis of Soviet estimates of the impact of fertilizer supply on crop output under current Soviet conditions I estimated that the net annual addition to Soviet GNP in the mid-1970s that could be attributed, directly and indirectly, to the superior technology embodied in imported Western fertilizer plant might be about $3·7 billion at 1973 US prices. This would represent a very high rate of return indeed on the $2 billion worth of imported Western fertilizer plant actually installed by the end of 1975. It should be stressed, however, that this is an experimental and very tentative estimate.

It should also be stressed that mineral fertilizer plant is a special case. Both the chemical industry, where the direct impact occurs, and agriculture, where most of the indirect impact occurs, are branches where a particularly large technological backlog existed in the early days of Khrushchev's "chemicalization" drive. Indeed, these two branches of the Soviet economy remain unusually backward to this day. The opportunities for imported technology to have a major impact are particularly great. This, of course, is precisely an example of a point

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made above: that areas selected for infusions of imported technology are likely, when imports are relatively so small, to be those that promise a very high pay off.

This survey suggests some key questions for further research. In the first place, there is a need for more case studies of the impact of imported technology in a particular branch or sub-branch. Passenger-car production, the pipeline transportation of natural gas and merchant shipping provide some possible cases for detailed study. Western press and industry sources provide a great deal of extremely detailed information on past Western plant sales, and both Soviet and Western sources can be used to complement this with a detailed picture of the industry's development. More case studies of this kind would not be conclusive about overall impact, but they could do a great deal either to strengthen or to cast doubt on aggregative conclusions derived from macro-econometric studies using the SRI-WEFA econometric model or a similar model. They could also help to provide some parameters for such studies.

The second obvious area of study concerns time-lags in the utilization of imported plant and know-how. It was noted above that anecdotal and aggregate statistical evidence seem to conflict on the matter of lags. Many Western suppliers of plant and know-how are actually in a position to say what the lags have been, in their experience. It may be difficult to collect these answers from a sufficiently large and representative sample of suppliers, but the attempt may well be worth making.

Another area where information from Western suppliers should be of use is the assessment of the cooperating Soviet domestic inputs used in conjunction with imported plant and know-how. The assessment of the impact—in the widest economic sense—of imported technology depends greatly on this. What is at issue here is not just the economic problem of measuring the " contribution " of imported machinery and know-how. There is also a question raised by Hardt and Holliday (Hardt and Holliday 1976, p. 8) which has obvious implications for Western policy: whether the utilization of imported Western technology has an important " resource-demanding " as well as " resource-releasing " effect on the Soviet domestic economy.

Presumably the utilization of superior imported technology in sector A will in general enable given inputs in sector A to produce more than they would have done without the imported technology. But at the same time this process may also draw into sector A (or into complementary sector B) resources which would not have been used at all in these sectors but for the decision to import Western technology. This may happen if either (a) the alternative to a major infusion of foreign technology into sector A was to leave that sector untransformed rather than seek to transform it by indigenous effort, or (b) the successful transformation of sector A by means of imported technology

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turns out to require major complementary resource shifts which the planners had not foreseen. The scale and frequency of any such occurrences can only be assessed by case studies.

In assessments of impact, time-lags and cooperating inputs, it is important to make comparisons with the speed, costs and benefits of such changes in Western countries importing technology. For policy purposes, the rate of change in technical level and productivity in the Western country or countries supplying the technology also has to be considered, for one of the matters ultimately at issue is whether negotiable technology transfer to the USSR is helping to close East-West technology gaps.

In general, it is important to be clear about the purpose of any investigation of East-West technology transfer. Confusion arises because different people approach the subject with different preoccupations. Some are concerned with a strategic issue: is technology transfer directly enhancing Soviet military capabilities? Others want to know if technology transfer will help the Soviet Union compete on world markets in certain high-technology fields. Then again there is the question of whether technology transfer is a stimulus to, or a substitute for, economic reform in the USSR; more broadly, there is the question of whether it favours or hinders a liberalization of Soviet society.

The main focus of this paper, however, has been on the impact of negotiable technology transfer on Soviet output. The answer seems to be, that a rather small West-East flow of machinery and know-how has had a proportionally rather large impact. It remains far from clear, however, that it has yet done much to assist the USSR to catch up with American levels of civilian technology.

References

(a) In English and German

Amann, R. " The Soviet Chemical Industry: Its Level of Modernity and Sophistication," CREES Discussion Paper, RC/C11, University of Birmingham, 1974.

Amann, R. " Soviet Technological Performance," paper presented at GWU/NSF Workshop on Soviet Science and Technology, Airlie, Va., Nov. 1976.

Becker, A. S. " Soviet Machinery Prices in the 1960s," *Soviet Studies*, July 1974.

Boretsky, M. " The Technological Basis of Soviet Military Power " in US Congress Joint Economic Committee, *Economic Performance and the Military Burden in the Soviet Economy*, Washington, 1970.

Boretsky, M. *The Soviet Challenge to US Machine Building: A Study in Production and Technological Policy*, Washington, US Government Printing Office, 1973.

Campbell, R. W. " Technology Transfer Among Communist Countries," *ASTE Bulletin*, Winter 1969.

Campbell, R. W. " Technological Levels in the Soviet Energy Sector," NATO Economic Directorate Colloquium, 1976.

Debelius, J. " Klärungen im deutsch-sowjetischen Patentaustausch und Lizenzverkehr," *VDI Nachrichten*, 28 Nov. 1975.

Dernberger, R. F. " Economic Development and Modernization in Contemporary China: The Attempt to Limit Dependence on the Transfer of Modern Industrial Technology from Abroad and to Control its Corruption of the Maoist Social Revolution," revised draft of paper presented to Conference on Technology and Communist Culture, 1975.

PRODUCED 2004 BY UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Desai, P. " Technical Change, Factor Elasticity of Substitution and Returns to Scale in Branches of Soviet Industry in the Postwar Period," mimeo, 1974.
Gomulka, S. *Inventive Activity, Diffusion and the Stages of Economic Growth*, Aarhus, 1971.
Gomulka, S. " Import of Capital Goods, Technical Change and the Rate of Development: A Generalized Capital-Vintage Model," paper presented to the Oslo Econometric Meeting, Aug. 1975.
Gomulka, S., and J. D. Sylwestrowicz. " Inter-Country Embodied Diffusion and Time Changes in the Factor Productivity Residual," paper presented at the Reisenburg Symposium, 1974.
Graham, L. R. " Sharing Science and Technology," *Annals of the American Academy of Political and Social Science*, July 1974.
Green, D. W., and M. Jarsulic. " Imported Machinery and Soviet Industrial Production, 1960–73: an Econometric Analysis," Soviet Econometric Model Working Paper, no. 39, Sept. 1975.
Green, D. W., and H. S. Levine, " Macroeconometric Evidence of the Value of Machinery Imports to the USSR," paper presented to the GWU/NSF Workshop on Soviet Science and Technology, 1976.
Hanson, P. " The Import of Western Technology," in Archie Brown and Michael Kaser (eds.), *The Soviet Union Since the Fall of Khrushchev*, London, 1975.
Hanson, P. " The Diffusion of Imported Technology in the USSR," NATO Economic Directorate Colloquium, 1976 (Hanson, 1976 (a)).
Hanson, P. " The Impact of Western Technology: A Case-Study of the Soviet Mineral Fertilizer Industry," paper presented to the Conference on CMEA Integration and East-West Trade, Bloomington, Indiana, 1976 (Hanson, 1976 (b)).
Hardt, J., and G. D. Holliday. " Technology Transfer and Change in the Soviet Economic System," revised version of paper presented to Conference on Technology and Communist Culture, 1975.
Hardt, P., and G. D. Holliday. " Western Technology and Economic Performance in Eastern Countries," Congressional Research Service paper HC 56 Europe, East, for House International Relations Committee Hearings on Export Administration, June 1976.
Hill, M. R. " Experience in the Use of Soviet-built General Purpose Machine Tools," mimeo, CREES, University of Birmingham, 1973.
Hill, M. R. *Standardization Policy and Practice in the Soviet Machine Tool Industry*, Ph.D. thesis, University of Birmingham, 1973.
Jewkes, J., Sawers, R., and Stillerman, D. *The Sources of Invention*, London, 1969.
Kiser, J. W. " Technology Is Not a One-Way Street," *Foreign Policy*, Summer 1976.
Maggs, P. B., and Jerz, J. W. " The Significance of Soviet Accession to the Paris Convention for the Protection of Industrial Property," *Journal of the Patent Office Society*, Apr. 1966.
Mansfield, E. " International Technology Transfer: Forms, Resource Requirements and Policies," *American Economic Review*, May 1975.
Nabseth, L., and G. F. Ray (eds.). *The Diffusion of New Industrial Processes*, London, 1974.
Office of the Director of Defence Research and Engineering. *An Analysis of Export Control of US Technology—A DoD Perspective*, Washington, 1976.
OECD. " Gaps in Technology," *Comparisons Between Member Countries*, Paris, 1970.
Perakh, M. " Utilization of Western Technological Advances in Soviet Industry," NATO Economic Directorate Colloquium, 1976.
Schneiderman, R. " High Technology Flows," *Electronics*, 8 Jan. 1976.
Slama, J., and H. Vogel. " On the Measurement of Technological Level for the Soviet Economy," in Z. Fallenbuchl (ed.), *Economic Efficiency Versus Other Objectives in the Soviet Union and Eastern Europe*, New York, 1975.
Slama, J., and H. Vogel. " Technology Advances in CMEA Countries," NATO Economic Directorate Colloquium, 1976.
Sutton, A. C. *Western Technology and Soviet Economic Development*, Stanford, 1973.
UN Economic Commission for Europe. E/ECE/844, *Analytical Report on Industrial Cooperation Among ECE Countries*, Geneva, 1973.
UN Economic Commission for Europe, Trade/R.320 (Secretariat note), Aug. 1975.
US House of Representatives, Committee on Banking and Currency, Sub-Committee on International Trade. *The Fiat-Soviet Auto Plant and Communist Economic Reforms*, Washington, 1967.

PRODUCED 2004 BY UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Wilczynski, J. *Technology in Comecon*, London, 1974.
Wiles, P. J. D. " On the Prevention of Technology Transfer," NATO Economic Directorate Colloquium, 1976.
Wilson, R. " International Licensing of Technology: Empirical Evidence," mimeo, n.d.

(b) In Russian

Artamonov, G. T. (interview). *Sotsialisticheskaya Industriya*, 22 Feb. 1975.
Bogomolov, O. " O vneshneekonomocheskikh svyazyakh SSSR," *Kommunist*, 1974, No. 5; " Chto vygodnee: sobstvennye NIR; OKR? Zakupka litsenzii? Import oborudovaniya? " *Ekonomika i organizatsiya promyshlennogo proizvodstva*, 1974, no. 2.
Gorodisskii, M. L. *Litsenzii vo vneshnei torgovle SSSR*, Moscow, 1972.
Luk'yanov, L. " V/O Tekhmashimport dlya sovetskoi khimii," *Vneshnyaya torgovlya*, 1974, no. 10; *Metodicheskie ukazaniya k razrabotke gosudarstvennykh planov razvitiya narodnogo khozyaistva SSSR*, Moscow, 1974.
Naido, Y., and S. Simanovskii. " Uchastie stran SEVa v mirovoi litsenzionnoi torgovle," *Voprosy ekonomiki*, 1975, no. 3.
Rybakov, O. " Ekonomicheskaya effektivnost' vneshnei torgovli," *Planovoe khozyaistvo*, 1974, no. 12.
Shatrov, V. P. " Okhrana inostrannykh izobretenii v SSSR i sovetskikh izobretenii za rubezhom," *Voprosy izobretatel'stva*, 1975, no. 2.
Sushkov, V. " O torgovo-ekonomicheskom sotrudnichestve s kapitalisticheskimi stranami v stroitel'stve v SSSR krupnykh promyshlennykh ob'ektov," *Vneshnyaya torgovlya*, 1976, no. 2.
Vlaskin, G., and S. Simanovskii. " Litsensionnaya praktika ChSSSR," *Voprosy izobretatel'stva*, 1975, no. 2.
Volynets-Russet, E. *Planirovanie i raschet effektivnost priobreteniya litsenzii*, Moscow, 1973.
Zakharov, S., and V. Sulyagin. " Sistema ASOP-Vneshtorg: tseli, zadachi, struktura," *Planovoe khozyaistvo*, 1974, no. 12.

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US-USSR Technological Interactions

Herbert I. Fusfeld

THE objective here is to provide some perspective on the nature of technological exchanges, not to present any quantitative data on their status and growth.

The principal feature of a technological exchange is that it must be concerned with the application and use of knowledge. If the subject involved is a well-established process or product, such as a welding process or a numerically controlled machine tool, then the exchange will give more attention to the integration of the technology into the receiving system. It if is not that well established, as for example the continuing development of magneto-hydrodynamics, then the exchange must at least include some work devoted to the ultimate use of MHD, including its transition from pilot stages to commercial use.

Such technological exchanges may be on a government-to-government basis. With a bilateral exchange between the US and a developing country the main concerns are natural resources or the development of the infrastructure of the Lesser Developed Country (LDC). These exchanges therefore have three principal characteristics:

1. The technology is generally well-established and in use within the US.
2. Much of the technology involved is owned by the US Government or is easily available to it, usually from the public domain, e.g. forestry, transportation, air traffic control, and other areas involving resources and systems.
3. The successful transfer of technology involves either modifications of the social structure or of established techniques (e.g. agricultural) and systems (e.g. transport), or of the decision at a national level about the commitment of major investment and labour.

When we consider government-to-government exchanges with other developed countries, either Western countries or the USSR, the concerns will be the same as in the case of the LDC's. However, in the case of the USSR, these may extend into selected industrial processes which, for the Western countries, are normally left to exchange within the private sector. In any case, such agreements with developed countries involve technologies which are not yet well established or proven, where both countries can contribute something to the development, and where both countries and perhaps all countries will benefit from the results. Many of these agreements today are in the fields of energy, transportation, and materials. The exploitation of these results depend, in the Western countries, on the cooperative

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efforts of government and industry. In the Soviet Union, each technological agreement is the responsibility of a ministry, which presumably incorporates into the appropriate five-year plan what is necessary to integrate successfully the technology development into their economy.

In brief, then, technological exchanges between governments tend to be broad in scope, but they have great limitations:

1. They involve technologies owned or controlled by the governments, which eliminates most products and industrial processes of the West.
2. They involve technologies which generate strong pressures from societies in both countries to accelerate development even at the cost of cooperation between competitors.

Whether we consider the US, our Western trading partners, the Third World, or the USSR, the differing needs of each call for greater technological interactions than are provided by the government exchanges which I have been discussing. They demand, and they require, interactions with the private sector of the West.

What will such interactions provide, what are their characteristics, and what are the implications of such exchanges with the private sector?

In trying to answer these questions I shall concentrate on exchanges between the US and the USSR.

The technology that is involved in US industrial processes, products, and in many services is owned by the private sector.

These factors appear to be well understood and accepted by the USSR. They do not appear to be as well understood, and are certainly not accepted, by the Third World countries, and the distinction is of interest to our subject. There is a difference, of course, between the specific technology involved in a new product or process and the procedures involved for its integration into production and its ultimate distribution or use within the economy. The analyses and planning involved in this process of integration, the allocation of resources by the corporation, are all intimately tied in with the US profit system. The Third World countries, as shown in past discussions and bilateral agreements and embodied in drafts of " codes of conduct " now being considered by UN groups, wish to separate these two phases. Their attempt to leave out the private profit involved in manufacture and sale is understandable, as is their hope that technology can then be acquired at a low price. What they do not understand, along with many in this country, is that the process of successful technological development involves interactions among technology, production, distribution, and financial planning. An attempt to separate the technology from the other factors can deprive the receiving country of its benefits, and at the very least will increase the cost and the time for its successful use.

What is interesting here is that the USSR, or at least those repre-

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sentatives I have worked with, understand these interactions clearly. Their focus is on how to adapt the techniques used successfully in a private enterprise system to the structure of a controlled economy. They are conducting intensive studies of US industrial research management and internal company practices for integrating R & D with company plans and operations.

The sophistication of the USSR in this area is evident in at least one respect. US bilateral agreements with developing countries are not limited only to the governments involved, but certain countries have indicated that they did not wish direct contact with the private sector of the US as part of these agreements. The USSR, on the other hand, requested that the original Science and Technology Agreement initiated by Messrs Nixon and Brezhnev in 1972 should contain the section known as Article IV, which encourages contact between " enterprises " for the purpose of technical exchanges. This section has been used *intensively by the USSR as the basis for establishing direct contacts* with US industry without any prior approach through the US government.[1] The point is that the USSR is well aware of the critical role of the US private sector regarding control of industrial technology; it is not scared off by the profit motive behind its development and use, and it is apparently confident that it can adapt both the technology and appropriate management techniques without serious changes in its overall economic and organizational structure.

The motives of the USSR in seeking and encouraging technological exchanges with US industry are quite obvious. Each agreement is in a defined area related to the needs of a specific ministry. The technology is clearly a means to an end, and in some agreements the ends are spelled out explicitly in terms of products or production.

In order to appreciate the nature and impact of such technological exchanges, let us consider the motivations of US industry. It should first be made clear that, with very few exceptions, no company is in business for the purpose of transferring technology. In order to be unambiguous, I will rephrase this to state that a company does not create profits and thus a return on its investment by the development and sale of technology. The specific exceptions to this are a very few independent R & D laboratories and, to some extent, certain engineering companies that design and construct new process equipment and complete plants.

Every industrial concern possesses know-how in its own technology, often based on patents, and such " information packages " may be available for licence or purchase. This income is then a by-product derived *after* the introduction and use of the technology by its developer.

[1] " Soviet-American Scientific and Technical Ties," I. Sheidina, *International Affairs*, Dec. 1974, pp. 46–51. Reviews the Soviet position on mutual advantages of science and technology agreements.

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The point is that a company profits from the use of technology, and only incidentally from the simple sale of knowledge. With this in mind, whenever an industrial concern becomes engaged in discussions with an outside organization, be it another company or a government, its interest is not to transfer technology but to establish a business relationship.

This business relationship may take many forms, all of which incorporate some type of technology transfer.[2] Consider the possible transactions between a US company and the USSR. If we define complexity as being the degree of involvement of the organizational structure of the USSR in carrying out its part of the business relationship, then one suggested list of such arrangements from the simple to the complex can be as follows:

1. Sale of commercially available consumer products to the USSR.
2. Sale of commercially available industrial products to the USSR.
3. Licensing rights to manufacture a product or use a process.
4. Establishing a joint development venture.
5. Establishing a manufacturing facility.

As we review the above list, there are a few simple characteristics that distinguish each item from either a government-to-government agreement of any sort, or from a scientific exchange. These are:

1. There is a well-defined objective involving use of the technology involved.
2. There is a well-defined statement of what is to be accomplished in a specific time.
3. There is, in almost every case, provision for payment to be made, either in money or in product.

In brief, each such agreement has been evaluated by both sides in terms of objectives, tasks to be performed, and value received. There is normally no value placed on the specific objective of advancing science or technology, though that may well be involved in carrying out the agreement. There is total value placed on the ultimate use of the technology involved.

This focus on use brings US industry into direct contact and negotiation with the USSR ministry responsible for the subject matter of the agreement. Depending on the terms and amount of money, the discussions might require the participation of representatives from the Ministry of Trade. And since we are concerned here with matters of technology, some representation of the State Committee for Science and Technology is almost always involved, at least in the early stages of discussions.

[2] " Transferring Technology to the Soviet Bloc: US Corporate Experience," Eric W. Hayden, *Research Management*, Sept. 1976, pp. 17–23. Reviews three types of agreements.

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THE role of the State Committee and its relations with the operating ministries in these technological exchanges with US industry are of some interest. Much attention has been devoted to the functions of overall technical planning, coordination and monitoring conducted by the State Committee. There is no question of its unique responsibilities on a broad national scale, and it is clearly the principal organizational unit encountered in government-to-government exchanges.

The technological agreements, with their specific objectives, time schedules, and payments, quickly fall within the operating responsibilities of the ministries. The State Committee often serves as a "marriage broker," a catalyst for bringing together US industry and a USSR ministry. It may occasionally serve as a representative of a ministry in preliminary discussions with the US acting in part through the relatively large staff assigned to the Science Counsellor of the Soviet Embassy. But substantive discussions having specific commercial content will normally involve ministry personnel by the second or third meeting. From then on, the SCST appears to take on the role of adviser and observer, with active planning and negotiations taken on by the ministry.

Once a US company has established good working relationships with a ministry, new agreements can be entered into without direct presence of State Committee personnel. It is assumed that the ministry keeps them informed. There are instances where a company, on good business terms with one ministry, is sent by them to a second ministry for negotiating a technical agreement of interest to the latter, again, without any obvious involvement of the State Committee.

There appears to be considerable autonomy and flexibility on the part of the ministries in these technological interactions with US industry. The technology and the objectives are directly relevant to the mission of the ministry. Most individual agreements do not involve huge allocation of resources. In these, there is every appearance that the ministry can move with authority. Clearly, it is up to the ministry to bring in any other organization needed for approval, but this does not mean that the US company must itself go through all these organizations in series.

The above comments are primarily based on experiences of large US corporations, well-known internationally, many working with the USSR over several years. They may not be as applicable to small companies, less well known, and new to the USSR.

The only safe generalization is that the ministries can be the principal actors in technical agreements with little overt participation by other groups. The broader the technology agreement, the greater likelihood there is that the State Committee will be part of the agreement process.

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The communication between the State Committee and the ministries is dependent on the actions of human beings, and there is no reason to believe that they are any less fallible, less ambitious, or less jealous in the USSR than they are in the US.

THERE now exists a large and growing number of technological exchanges between the USSR and private industry of the US. They are essentially not on the level of government-to-government agreements, although a large fraction are reported under Article IV of the Cooperative Agreement on Science and Technology. Any physical transfer of reports, equipment, blueprints or materials from the US must receive a licence from the Department of Commerce, so there is some mechanism for identifying actions that reach that stage.

Collectively, these exchanges provide insight into Soviet needs, personnel, and organizational structure. Economically, each agreement is of value to the company involved or the agreement would stop. The political implications, effect on national security, and ultimate impact on the US industrial competitive status are not judgments that an individual company can make.

There are, in fact, several issues to do with this trade in technology which cannot be considered here, but which should form the basis for further studies. Among these are:

1. What is the relative importance of US private industry technology exchanges with the USSR in terms of requirements, etc., contained in such exchanges compared with similar Soviet trade with Japan and Europe?
2. What steps might be taken to strengthen the US in international technology exchanges by changes in such governmental conditions as anti-trust statutes, taxation of foreign facilities, tariffs, or patents?
3. What is the relative flow of technology to the USSR from US private industry, by quantity and by subject matter
   (a) Directly
   (b) Indirectly, via Europe or Japan
   (c) Indirectly, via an Eestern Bloc country? [3]

I have not dealt with the question of how efficiently the USSR makes use of the technology involved in these exchanges.[4] This is another obvious area for further study. In this regard, the experiences of the US private sector are invaluable. The immediate mechanism for using the technology is often part of the specifications contained in a technology

[3] Bi-weekly publication *East-West Markets*, published by Chase World Information System. Reviews a broad spectrum of business developments between all Western countries and Eastern Europe.

[4] "Western Know-how Comes Home to Roost," *Chemical Week*, 28 Jul. 1976, pp. 39–40. Gives examples of Western technology sales resulting in product flow from East Bloc to Western countries.

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agreement. The planning activities, the responsibilities of key technical managers, the integration of a new process into an existing system are often built into the agreement, or at least form major areas of contact between the people in industry in the US and their Soviet counterparts. These experiences provide the foundation for the growth or limits of future technological interactions.

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Soviet Machinery Imports

Donald W. Green and Herbert S. Levine

Introduction

In a paper contributed to the March 1976 NATO Colloquium on East-West Technological Cooperation, we presented for the first time some quantitative estimates of the value of technology transfer to Soviet industry. These estimates reflected direct and indirect returns of imported machinery and were based upon a methodology developed in the construction of the SRI-WEFA Soviet Model.[1] For a detailed discussion of that methodology, the reader should consult those papers cited in footnote 1. In brief, the methodology involved the calculation of a measure of the stock of imported machinery, the disaggregation of total capital into foreign machinery and domestic capital (machinery and structures) and the statistical estimation of the relative contribution of these components to the growth of Soviet industry. The full econometric model, SOVMOD II, was used to evaluate the direct and indirect contributions of imported machinery to Soviet industrial growth in retrospective and projective scenarios.

The quantitative results reached in the NATO paper suggested that the indirect effects of technology transfer may have been quite significant. The production function estimations indicated that when auxiliary costs, associated with foreign machinery, were included, a ruble's worth of imported machinery was three to four times as productive as a ruble's worth of domestic capital. Moreover, where the increase in machinery imports associated with the policy of *détente* were removed, the growth in industrial production over the period 1968–73 fell by 5 percentage points.

These macro-econometric results were clearly at variance with the widely accepted impression that the Soviets had difficulties in absorbing advanced technology, a perception which has become established from valuable micro-economic studies of technology transfer and diffusion.[2] One of the problems of a number of micro studies, is the tendency to compare Soviet efficiency using foreign technology with the efficiency of the foreign nation itself. A more appropriate comparison would be between Soviet efficiency using foreign technology and Soviet efficiency

[1] Donald W. Green and Herbert S. Levine, " Implications of Technology Transfers for the USSR," in NATO, Economic Directorate, *East-West Technological Cooperation*, Brussels, 1976. This interpretative use of the model was based upon the econometric results reported in Donald W. Green and Marc Jarsulic, " Imported Machinery and Soviet Industrial Production, 1960–1973: An Econometric Analysis," Soviet Econometric Model Working Paper 39, Sept. 1975.

[2] Major studies of this issue have recently been published by Granick and Berliner: David Granick, *Soviet Introduction of New Technology: A Depiction of the Process*, SSC–TN–2625–7, SRI/Strategic Studies Center, 1975; Joseph S. Berliner, *The Innovation Decision in Soviet Industry*, The MIT Press, Cambridge, Mass., 1976.

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using domestic technology. On the other hand, our macro-econometric estimates depend upon two elements about which serious questions can be raised. They are:

1. the valuation of imported foreign machinery in domestic Soviet prices, and
2. the specification of production functions for Soviet industry.

In this paper, we have revised our earlier macro-econometric estimates using the newer version of the SRI-WEFA Model, SOVMOD III.[3] In addition, we shall devote further attention to the appropriate interpretation of those results.

Recomputation Results

The magnitude of the impact of imported machinery on industrial output depends on the calculation of the domestic value of the foreign machinery stock and the specification of the production function. Our methodology has been partially revised in both areas as we have become more concerned with the sensitivity of results to choices in measurement and specification.

On revising our computations of the domestic value of the stock of imported machinery, we have made adjustments in the dollar-ruble conversion, the conversion from foreign trade rubles to domestic rubles, and the machinery price deflator. The essential computation method is illustrated by the following identity from SOVMOD III:

(K.18) KIW Industrial Capital Western Machinery (End Year Value)

$$KIW = 0{\cdot}95\ KIW_{-1} + 0{\cdot}0712\ (MIEIN\$/PREX9.P71GE9)_{-1}$$

The assumptions of a 5 per cent retirement rate and a one-year installation lag have been retained until improved estimates of those parameters are provided from micro-economic studies. The current dollar value of Soviet machinery imports (MIEIN$, M.US$) is deflated by the West German export price for non-electrical machinery (P71 GE9, 1970 = 100.) and converted to rubles at the official exchange rate (PREX9, $ per R.).[4] The coefficient of 0·712 for converting foreign trade rubles into domestic rubles for machinery was determined by Kostinsky and Treml for the 1966 Soviet I–O Table.[5] (The additional factor of ·1 is necessary to convert the derived series KIW to

[3] An introduction to the SRI-WEFA Model is provided in Donald W. Green and Christopher I. Higgins, *SOVMOD I: A Macroeconometric Model of the Soviet Union*, Crane-Russak and Academic Press, New York, 1977. The latest version is documented in Donald W. Green, Gene D. Guill, Lawrence R. Klein, Herbert S. Levine, Peter Miović and Ross Preston, *The SRI-WEFA Soviet Econometric Model: Phase Three Documentation*. Vol. I. SSC–TN–2970–5, May 1977.

[4] An earlier error in the dollar/ruble conversion procedure in Green and Jarsulic, op. cit. inflated the domestic values of imported machinery by approximately 25 per cent. This did not affect the estimation results significantly because of the shortened sample period in those estimations.

[5] Barry L. Kostinsky and Vladimir G. Treml, *Foreign Trade Pricing in the Soviet Union: Exports and Imports in the 1966 Input-Output Table*, FER–No. 8, US Department of Commerce, March 1976.

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billions of rubles.) Among the issues which remain unresolved in this calculation are the growth in domestic machinery prices between 1966 and 1970 and the relationship between 1970 machinery prices and " constant 1955 " prices for fixed capital.

A major consequence of this recomputation is to reduce the share of Western machinery in Soviet industrial capital from 4 per cent and 2 per cent, a result more consistent with calculations made by Hanson.[6] These derived capital series and their annual rates of growth are shown in Table 1. With the possible exception of the series for Western chemical equipment which grew very rapidly in 1961–62, these capital data seem reasonable.

The specification of industrial production functions in the SRI-WEFA Model was revised during the estimation of SOVMOD III. The Cobb-Douglas specification was retained but is now estimated in growth rates rather than in log-linear form.[7] Furthermore, the aggregate production function for Soviet industry has been replaced for most

TABLE 1

Estimated Stocks of Foreign Machinery, 1960-1974, January 1

(Units are B. 1966 Rubles)

Year	Aggregate Industry (KIW)	Petroleum Products (KIPPM)	Chemicals & Petrochemicals (KICHW)	Machine Building & Metal-Working (KIMBM)
1960	1·388	0·252	0·189	0·529
1961	1·642	0·295	0·310	0·600
1962	1·923	0·370	0·413	0·670
1963	2·216	0·469	0·468	0·747
1964	2·468	0·583	0·551	0·825
1965	2·653	0·717	0·619	0·911
1966	2·778	0·855	0·679	0·974
1967	2·934	0·937	0·763	1·022
1968	3·214	1·037	0·865	1·083
1969	3·656	1·173	0·984	1·193
1970	4·179	1·282	1·049	1·349
1971	4·559	1·364	1·056	1·584
1972	4·841	1·452	1·088	1·691
1973	5·237	1·508	1·169	1·864
1974	5·630	1·537	1·248	2·063

[6] Philip Hanson, " Technology Transfer," in Joint Economic Committee US Congress, *The Soviet Economy in a New Perspective*, Washington, D.C., 1976. See also his earlier paper, " The Import of Western Technology," in Brown and Kaser (eds.), *The Soviet Union Since the Fall of Khrushchev*, Macmillan, 1975.

[7] The selection of this specification is discussed in Donald W. Green, " The Microfoundations of the Soviet Production Functions: An Engineering Approach," Soviet Econometric Model Working Paper 45, April 1976; see also Green, *et al. The SRI-WEFA Soviet Econometric Model*, pp 64–67.

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TABLE 1
(continued)

Growth Rates, Stock of Foreign Machinery, 1961-1974

Year	Aggregate Industry	Petroleum Products	Chemicals & Petrochemicals	Machine-Building & Metal-Working
1961	18·3	17·4	64·2	13·5
1962	17·1	25·2	33·4	11·7
1963	15·3	27·0	13·4	11·5
1964	11·4	24·1	17·6	10·4
1965	7·5	23·1	12·4	10·5
1966	4·7	19·1	9·7	6·9
1967	5·6	9·6	12·4	4·9
1968	9·5	10·7	13·4	5·9
1969	13·8	13·1	13·7	10·1
1970	14·3	9·3	6·6	13·1
1971	9·1	6·4	0·6	17·5
1972	6·2	6·5	3·1	6·7
1973	8·2	3·9	7·5	10·3
1974	7·5	1·9	6·7	10·6
Mean Annual Growth Rate 1961-1974	10·5	13·8	14·5	10·2

experiments by an aggregation over branch outputs determined by branch production functions. When the aggregate production function was re-estimated, the output elasticity for imported machinery was found to be no longer statistically significant, if the conditions of the harvest were included in the specification. The production functions in SOVMOD III are summarized in Table A–1 and are also presented as estimated in the Appendix. While the significance of imported machinery has fallen at the industrial sector level, the previous branch results for chemicals, petroleum and machine-building are substantiated by the new estimations.

There have also been some minor changes in the equations of the demand for machinery imports which are presented in Table A–2.[8] Whereas the previous *détente* term was a composite shift-trend variable, the post-*détente* trend has now been separated from the shift and is significant only for machinery classifications FTN12 (mining, metallurgical and petroleum M & E) and FTN10 (metal-working M & E). The estimated *détente* shift coefficients remain quite large, e.g. 44 per cent for all industrial machinery and 37 per cent for metal-working

[8] The specification for these machinery import demand equations is discussed in Green and Levine, op. cit.

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TABLE A-1

Production Function Estimations with Capital Disaggregation—

SOVMOD III*

INDUSTRIAL CATEGORY	OUTPUT ELASTICITY Imported Machinery αF	OUTPUT ELASTICITY Domestic Capital αD	RATIO OF SAMPLE MEANS $\bar{K}^F / \bar{K}^D$	RATIO OF MARGINAL PRODUCTS RK
Aggregate Industry	0·115 (1·06)	0·417 (3·62)	·0197	14·0
Chemicals and Petrochemicals	0·089 (3·51)	0·192 (4·45)	·0571	8·1
Petroleum Products	0·253 (3·98)	0·385 (3·80)	·0809	8·1
Machine Building and Metal Working	0·196 (2·75)	0·260 (3·03)	·0344	21·9

* Full production function estimations from SOVMOD III follow this table. For estimated parameters, t-statistics are in parentheses. Sample-period capital means are computed over 1960–74. The ratio of marginal products is computed as follows:

$$RK \equiv \frac{\alpha^F / \alpha^D}{\bar{K}^F / \bar{K}^D}$$

machinery.[9] The magnitude of these coefficients was a principal factor in the measurement of the no-*détente* impacts presented in our earlier paper.

It is important to emphasize that this macro-econometric approach to technology transfer remains quite controversial at the methodological level. The measurement of the stock of imported machinery should be refined further with additional information on installation lags, retirement rates for machinery and equipment, and foreign and domestic machinery prices. These calculations should be extended to other categories of machinery and equipment in order to test the robustness of the methodology for other sectors and branches, e.g. transportation and electro-energy.

A further problem is the lack of correspondence between the industrial branch classification and the machinery trade classification.[10] For example, the foreign trade category of metal-working machinery

[9] Because of the log specification, the coefficient estimated for the *détente* shift (QSH68) must be exponentiated to find the shift percentage.

[10] See the discussion of this issue in Green and Jarsulic, op. cit.

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TABLE A-2

Demand Equations for Soviet Machinery Imports, SOVMOD III

Machinery Category (Equation)	Constant	Liquidity	Détente Shift	Détente Trend	Other Variables	R^2 D.W.
	α_0	α_1	α_2	α_3	α_4	
All Machinery from Developed West (M.7)	3·721	0·217	0·325	—	−0·078 Q6466	0·671
	(64·18)	(3·22)	(2·47)	—	(0·82)	2·37
Machinery from Developed West, excl. Transport (M.18)	3·486	0·176	0·368	—	−0·341 Q6466	0·844
	(55·88)	(2·42)	(2·60)		(3·33)	2·27
Chemical M & E, Developed West (M.19)	4·747	0·359	0·337	—	−0·478 QFYP	0.667
	(46·90)	(2·79)	(1·55)		(3·62)	2·41
All Mining, Metallurgical & Petroleum M & E (M.20)	4·362	0·095	0·124	— ·134	·169 QFYP	0·909
	(87·67)	(1·45)	(1·07)	(4·86)	(2·60)	2·45
All Metal-Working (FTN 10) (M.21)	3·953	0·274	0·313	0·56	·363 Q70	0·797
	(92·63)	(4·23)	(2·60)	(1·95)	(2·91)	2·15

* Estimations over the sample period 1961–73. All estimations done with the following specifications:

$$\text{In } 100.\ \frac{M}{PM_{-1}} = \alpha_0 + \alpha_1 \frac{FLQ_{-1}}{INV} + \alpha_2\ QSH68 + \alpha_3\ QSH68(QT50\text{–}19.) + \alpha_4\ OTHER$$

Q6466	Dummy Variable
QFYP	Five-Year Plan Cycle Variable
Q70	Dummy Variable for 1970 (Fiat Plant Deliveries)
QSH68	Dummy Variable 1968 on (Détente)

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(FTN 10) is not synchronous with the branch category of machine-building and metal-working. The former category includes some machinery and equipment installed in other industrial branches. The branch machinery category includes imported machinery from other foreign trade categories as well.

Finally, the issue involves the specification of the production functions where the SRI-WEFA approach departs from established practice.[11] The estimation of the contribution of imported machinery has not been done within a CES specification nor has Gomulka's alternative methodology of relating the technical progress term directly to past levels of machinery imports been attempted.[12]

SOVMOD III [13] Results

A. The Benefits of Imported Machinery for Soviet Industrial Growth, 1973–1980

The first experiment with SOVMOD III was to replicate Scenario II of our earlier paper: 10 per cent shifts in the machinery demand functions over the period 1973–80. These shifts in the demand functions allow one to evaluate the direct and indirect effects of machinery imports on the growth of Soviet industry. Again, a control or baseline projection to 1980 has been used as the reference standard for the scenarios. Using the new model, we have performed this experiment twice, once with the branch aggregation procedure and once with the aggregate industrial production function. The results are compared in Table 2 for the three sets of experiments.

In interpreting these results, several factors need to be considered. First, there are clear differences between the control solution used for the SOVMOD II experiments and the current baseline solution for SOVMOD III. These arise from additional information now available for 1975 and more extensive use of 10th five-year plan information for projecting employment growth. The final column of Table 2 is the most useful indicator since it measures the percentage impact on the growth rate 1975–80 in the control solution. The differences in impact arise from the changes in measurement and specification. The impacts on petroleum and machine-building have increased moderately, the impact on aggregate industry has decreased by 50 per cent and the impact on the chemical branch has declined by 90 per cent.

[11] Within the Cobb-Douglas specification, we have experimented with various lag assumptions, price deflators and initial conditions for the stock of imported machinery; the estimation results are robust in those tests, particularly at the branch level. As Martin Weitzman and others have suggested, similar sensitivity tests need to be performed with the CES specification.

[12] Stanislaw Gomulka, "Soviet Post-war Industrial Growth, Capital-Labor Substitution and Technical Change: A Re-examination," in Z. M. Fallenbuch (ed.), *Economic Development in the Soviet Union and Eastern Europe, Vol. I: Reforms, Technology, and Income Distribution*, Praeger (New York, 1975).

[13] The authors wish to acknowledge the assistance of Daniel Bond in preparing these Scenarios with SOVMOD III.

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TABLE 2

10% Demand Shift Scenarios, 1973–1980*
Industrial Growth Rates, 1975–1980

	Scenario A 10% Down	Control Solution	Scenario B 10% Up	Impact Percentage of Control
I. SOVMOD II Experiment, Aggregate Production				
Total	30·8	31·8	32·8	3·14
PP	36·6	37·5	38·5	2·40
CH	31·3	33·5	35·5	6·57
MB	32·7	33·5	33·9	2·39
II. SOVMOD III Experiment, Branch Aggregation				
Total	26·2	26·6	27·0	1·50
PP	18·0	18·6	19·3	3·23
CH	41·1	41·4	41·7	0·72
MB	34·6	35·6	36·5	2·81
III. SOVMOD III Experiment, Aggregate Production Function				
Total	22·6	23·0	23·4	1·74
PP	18·0	18·7	19·3	3·74
CH	41·1	41·4	41·7	0·72
MB	34·7	35·6	36·6	2·53

* This comparison is based on Soviet industrial growth indexes constructed by the office of Economic Research. Differences in SOVMOD II and SOVMOD III Control Projections arise from model differences and different assumptions for exogenous variables, and different adjustments to endogenous variables.

If the branch impacts in SOVMOD III are valid, then the branch aggregation procedure (II) represents a conservative estimate for aggregate industry since direct effects in other branches are ignored. However, when the aggregate production function, which is weaker statistically is used (Experiment III) the impact is only slightly greater: 1·74 per cent rather than 1·50 per cent.

Table 3 outlines the derivation of the dynamic multiplier for Experiment II. Thus the multiplier calculated for SOVMOD III is approximately two-thirds the value of the one calculated for SOVMOD II.

B. The Retrospective Repeal of Détente, 1968–1973

Using a baseline solution for 1968–73 with SOVMOD III, we have repeated the previous experiment of repealing the machinery import consequences of *détente*. This is a very restricted definition of *détente* and is used to calculate Soviet economic gains from the import of machinery where the historical environment is held constant: Soviet

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TABLE 3

Derivation of the Dynamic Multiplier for Western Machinery Imports 1973–1980

MI70 Machinery Imports from Developed West for Soviet Industry, B. 1970 Rubles
XI70 Soviet Industrial Production, B. 1970 Rubles
△ Difference, Control-Scenario Values

YEAR	△MI70	△XI70	
1973	0·0657	0	
1974	0·1017	0·223	
1975	0·1166	0·514	
1976	0·0986	0·805	
1977	0·0875	1·012	
1978	0·0905	1·183	
1979	0·1004	1·372	
1980	0·1078	1·560	
5-Year Cumulation 1973–1978	0·470	3·737	Multiplier 8·0
7-Year Cumulation 1973–1980	0·661	6·669	10·1

Multiplier Calculation: $\sum_{i=1974}^{n} \triangle XI70 / \sum_{j=1973}^{n-1} \triangle MI70$

TABLE 4

The Impact of Détente: Main Indicators

Category	Percentage Growth, 1968–1973 Détente Baseline	Half Détente	No Détente
Gross National Product	28·7	28·1	27·6
Total Industrial Output	32·1	30·8	29·6
—— Machine-Building	43·9	40·0	36·5
—— Chemicals	48·4	47·4	46·6
—— Petroleum Products *	33·3	33·7	32·8
Foreign Trade Turnover	64·3	63·8	63·2
Real Consumption	24·0	23·1	22·2
		Value in 1973	
Stock of Western Machinery (Jan. 1, B. 1955 Rubles)	5·312	4·878	4·444
Hard Currency Reserves (M. Current $)	3092	3217	3338

* The apparent inconsistent effect of *détente* in petroleum products arises from the estimated negative coefficient for the post *détente* trend.

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policy variables, the weather, and conditions in the world economy. Because the *détente* shift coefficients were so large in the estimated import demand equations, we have also prepared an intermediate model with one-half the estimated *détente* shifts. (for figures see Table 4).

In general terms, the new experiments suggest that the contribution of imported machinery to Soviet industrial growth is about one-half of our previous estimates. Instead of the reduction in the industrial growth rate 1968–73 of more than 5 percentage points (15 per cent of the growth rate in baseline solution), that rate is now reduced by approximately 2½ percentage points (8 per cent of the growth rate in the baseline). This difference in impacts is also observed in the dynamic multiplier derived in Table 5, which is now 8 rather than 15. The differences between these SOVMOD II and III experiments arise primarily from the refinement in stock measurement and the shift away from the aggregate industrial production function to an aggregation over branch outputs. The major impact now occurs in the machine-building branch with smaller impacts in chemicals and petroleum products. As in the earlier study, the reduction in GNP associated with smaller imports of machinery falls almost entirely on personal consumption. Soviet hard currency exports are more responsive to imports in the new model so that the gain in hard currency reserves is only ·25 B.Current$ on the no-*détente* path, compared with the 1·2 B.$ gain in the SOVMOD II experiment. Over the period covered by the model hard currency exports are 160M.$ less on the *no-détente* path.

TABLE 5

Derivation of the Dynamic Multiplier for Western Machinery, 1968–1973

MI70 Soviet Imports of Machinery and Equipment for Industry, from Developed West (B. 1970 Rubles)
XI70 Soviet Industrial Production (B. 1970 Rubles)
△ Difference between Baseline and No Détente

Year	△MI70	△XI70
1968	0·284	—
1969	0·256	0·503
1970	0·263	1·013
1971	0·265	2·455
1972	0·299	2·987
1973	0·301	3·777

$$\text{Dynamic Multiplier} = \frac{\sum_{1969}^{1973} \triangle XI70}{\sum_{1968}^{1972} \triangle MI70}$$

$$= 10{\cdot}762/1{\cdot}367$$

$$= 7{\cdot}9$$

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Conclusions

These estimates of the value of machinery imports for the USSR are smaller than our previous estimates, but are still substantial. Such magnitudes are no longer contradictory to all micro-economic analysis; an important consequence of the extended discussion of technology transfer in this and previous meetings has been to narrow the gap between macro- and micro-economic approaches.[14]

To facilitate the interpretation of those results for a complex issue such as technology transfer, three levels of analysis may be distinguished:

1. macro-economic prediction
2. attribution and causality
3. micro-economic and historical analysis

The role played by these levels may be illustrated by referring to the debate in the West on the issue of monetarism. Major research on monetarism tended to occur first at levels 1 and 3: the demonstration of macro-economic correspondence between the money supply and national income is parallel with the micro-economic analysis of the demand for money. It is at level 2 that the major debates continue since resolution depends upon the establishment of a model consistent with evidence at both macro-economic and micro-economic levels.

In the analysis of technology transfer to the Soviet Union, major research has occurred at level 3 with limited attempts to aggregate such evidence to reach conclusion at level 2. The SRI-WEFA approach began at level 1 with a focus upon predicting Soviet industrial growth followed by a jump to level 2 with a simple model of importing, learning and production. While there remain technical issues concerning the predictive significance of machinery imports, the more important issues concern the appropriate interpretation of those dynamic multipliers of 8–10 should they be validated by later observations and stricter econometric analysis.

As we suggested in the earlier paper, there are two factors which must be considered carefully in judging the implications of these macro-economic estimates for the quantitative understanding of technology transfer:

1. The disequilibrium of the Soviet economy with respect to Western technology at world prices;
2. The role of complementary inputs to foreign machinery and the issue of unobserved costs in technology transfer.

When national economies are buffered from the world economy with production structures and price systems evolving independently, the

[14] Of particular relevance is Hanson's evaluation of the indirect benefits of mineral fertilizer technology for Soviet agriculture; P. Hanson, "The Impact of Western Technology: A Case Study of the Soviet Mineral Fertilizer Industry," paper presented at the Conference in Integration in Eastern Europe and East-West Trade, Bloomington, Indiana, October 1976.

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consequences of disequilibrium are static inefficiency but also large potential gains from trade during adjustment. However, the magnitude of the multiplier we have calculated for imported machinery arises in part because of the distortions in the Soviet price system which under-price machinery and over-price raw materials.

In the calculation of the multiplier, the incremented industrial value added in the established prices of 1970 has been divided by the expenditure on Western machinery in 1970 domestic rubles. On the average, Soviet expenditure of one million foreign trade rubles on Western machinery (0·712 m. domestic rubles) might be financed by one million foreign trade rubles of hard currency raw materials exports (1·3–1·5 m. domestic rubles). This would mean that a multiplier calculated in domestic established prices of 8 is equivalent to a multiplier of 4 at world prices. It may be even less on the margin when the opportunity cost of expanding hard currency exports is correctly measured.

A second important factor is the unobserved cost involved in the transfer of foreign technology. In Western discussions of East-West technology transfer, it often appears that the analysis is more concerned with comparing Soviet utilization of Western technology with its utilization in the West. The argument is that the Soviets utilize Western technology much less effectively than in the West, and therefore Soviet gains from technology cannot be substantial. However, the comparison which is most relevant for evaluating gains from technology transfer is between Soviet utilization of Western technology and Soviet utilization of Soviet technology. However, our methodology may well exaggerate the contribution of imported machinery by not including the contribution of the full complex of expenditure on technology transfer. Soviet enterprises using Western machinery and processes typically have superior access to scarce complementary inputs: higher-grade materials (often imported), skilled manpower, and scientific-technical support from research institutes. This does not necessarily reduce the predictive value of our approach, but does reduce its "distributional" power to attribute incremental output to primary factors. It should be stressed, furthermore, that the application of complementary quality inputs to technology transfer may have adverse effects on other sectors of the civilian economy or on the military economy.

One of the most significant categories of unobserved costs is the scientific-technical support of technology transfer and absorption. At the branch level of Soviet industry, machinery imports may represent only the most visible category of a much broader application of scientific resources to technical change. Historically, while the rate of growth of science expenditures was declining in the 1960s, there *may* have been a shift of some research and development resources to the civilian sector from direct use in the military sector. The emphasis on

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technology transfer first appeared in the chemicals and petroleum branches in the early 1960s and then spread to other technologies after 1967. This diversification of transfers of technology may have simply absorbed an existing slack in the scientific establishment, but it is more likely the result of the diversion of resources from elsewhere in the economy.

APPENDIX

Industrial Production Functions Using Stocks of Imported Machinery

SOVMOD III

X.9 *XIPP Branch Output: Petroleum Products*

(a) *Primary Factors*

$$(\mathrm{XIPP}/\mathrm{XIPP}_{-1}-1) - \underset{(0\cdot081)}{0\cdot373}\,(\mathrm{NMIPP}/\mathrm{NMIPP}_{-1}-1)$$

$$= \underset{(3\cdot80)}{0\cdot38503}\left(\frac{\mathrm{KIPP}-\mathrm{KIPPM}}{\mathrm{KIPP}_{-1}-\mathrm{KIPPM}_{-1}}-1.\right) + \underset{(3\cdot98)}{0\cdot25252}\,(\mathrm{KIPPM}/\mathrm{KIPPM}_{-1}-1).$$

$R^2 = 0\cdot070$ S.E. $= 0\cdot026$ D.W. $= 1\cdot46$

Sample Period 1959–1974 Fit $= 0\cdot9961$

X.12 *XICH Branch Output: Chemicals and Petrochemicals*

(a) *Primary Factors*

$$(\mathrm{XICH}/\mathrm{XICH}_{-1}-1.) - \underset{(0\cdot077)}{0\cdot359}\,(\mathrm{NMICH}/\mathrm{NMICH}_{-1}-1.)$$

$$= \underset{(4\cdot45)}{0\cdot19157}\left(\frac{\mathrm{KICH}-\mathrm{KICHW}}{\mathrm{KICH}_{-1}-\mathrm{KICHW}_{-1}}-1.\right) + \underset{(3\cdot51)}{0\cdot08902}\,(\mathrm{KICHW}/\mathrm{KICHW}_{-1}-1.) + \underset{(5.78)}{0\cdot04736}\,(1.-\mathrm{QSH65})$$

$R^2 = 0\cdot194$ S.E. $= 0\cdot022$ D.W. $= 2\cdot37$

Sample Period 1959–1974 Fit $= 0\cdot9984$

QSH65 Dummy variable equal to 1 up to 1964, 0 thereafter.

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X.13 *XIMB Branch Output: Machine Building and Metal Working*

(a) *Primary Factors*

$$\begin{aligned}\text{XIMB/XIMB}_{-1} - 1.) &= \underset{(5\cdot36)}{0\cdot90712}\ (\text{NMIMB/NMIMB}_{-1} - 1.)\\ (0\cdot079) \quad &+ \underset{(3\cdot03)}{0\cdot26028}\left(\frac{\text{KIMB} - \text{KIMBM}}{\text{KIMB}_{-1} - \text{KIMBM}_{-1}} - 1.\right)\\ &+ \underset{(2\cdot75)}{0\cdot19633}\ (\text{KIMBM/KIMBM}_{-1} - 1) - \underset{(6\cdot62)}{0\cdot04883}\ \text{Q6365}\end{aligned}$$

$R^2 = 0\cdot738$ S.E. $= 0\cdot010$ D.W. $= 1\cdot72$

Sample Period 1959–1974 Fit $= 0\cdot9994$

X.19 *XIT Industrial Output*

(c) *Aggregate Production Function, Capital Disaggregation*

$$\begin{aligned}\ln \text{XIT} - \underset{(0\cdot781)}{0\cdot37}\ (0\cdot845 \ln (\text{NMI} - \text{NIET}) + 0\cdot155 \ln \text{NIET}) &=\\ - \underset{(3\cdot11)}{1\cdot44177} + \underset{(3\cdot62)}{0\cdot41735} \ln (\text{KIA} - \text{KIW}) + \underset{(1\cdot06)}{0\cdot11497} \ln \text{KIW}&\\ - \underset{(3\cdot66)}{0\cdot03522}\ \text{Q6466} + \underset{(0\cdot98)}{0\cdot07159}\left(\frac{\text{XAGT70}}{\text{XAGTN}} - 1.\right)&\end{aligned}$$

$R^2 = 0\cdot997$ S.E. $= 0\cdot014$ D.W. $= 0\cdot58$

Sample Period 1960–1974 Fit $= 0\cdot9974$

Where

XIT	Aggregate Industrial Output, 1970 = 100., OER (1975)
NMI	Average Annual Employment, Th. Persons, FDAD (1975)
NIET	Engineering-Technical Manpower, Th. Persons, NKh.
KIA	Total Basic Funds, Jan. 1, B. 1955 R. NKh.
KIW	Imported Western Machinery, Jan. 1, B. 1955 R., SRI (1976)
XAGT70	Gross Agricultural Output, B. 1970 R., OER (1976)
XAGTN	Normal Agricultural Output, B. 1970 R., SRI (1976)

Branch industrial variables follow sectoral conventions.

Q6466 Dummy variable equal to 1 for 1964–66.

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Samizdat:

The Case of Igor Melchuk

Trial at the Academy 25.3.76.

On 25 March 1976 the Academic Council of the USSR Academy of Sciences Linguistic Institute debated the re-election of senior research assistant I. A. Melchuk.

Background Note: Under the rules of Soviet Academy of Sciences, junior research assistants are re-elected by their Institute's Academic Council once every three years; and senior ones every five years. The Council members vote on such re-elections in secret. These are generally routine procedures, often not even attended by the person seeking re-election. Non-re-election leads to the person's dismissal any time within the next 12 months. There are some alternatives: the Director may offer the non-elected staff member a lower-grade position; he may oppose the Council's decision and arrange for a second re-election; there is also the chance of appeal to the Presidium of the Academy of Sciences.

In the last six years, the issue of re-election has been used in the Soviet Academy of Sciences to bring about the dismissal of those who have found disfavour with the authorities. In the Academy's Russian Language Institute (Director: associate member of the Academy of Sciences F. P. Filin) the following linguists were—between 1970 and 1973—dismissed as a result of non-re-election or forced to leave under threat of non-election: Yu. D. Apresyan; N. A. Eskova; S. K. Pozharitskaya; V. Z. Sannikov; T. S. Khodorovich; L. N. Bulatova; E. I. Khanpira; L. P. Krysin; L. L. Kasatkin: all of them eminent scholars and foremost specialists in their field. Their sole crime (and this was explicitly outlined in the Academic Council's statement) was that at different times and for different reasons they had affixed their signatures to letters addressed to the highest party and state bodies in the land—the Communist Party Central Committee; the Council of Ministers; and the Presidium of the Supreme Soviet—letters which expressed a point of view diverging from the official one on the subject of dismissals and trials of Soviet cultural figures.

Some "pre-history": As rumour has it (and it happens to emanate from a highly reliable source), in the summer or early autumn of 1975—i.e. long before Melchuk's re-election and his letter in the *New York Times*—a secret party meeting at the Linguistic Institute debated the question of Melchuk's re-election. Issues are often settled in this way not by the Academic Council but by the Party organization, whose decisions are binding on all Communist members

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of the Academic Council. As a rule Communist members of Academic Councils constitute an absolute majority. A stormy debate ended in the decision to re-elect Melchuk. But later there was a protest from the opponents of this decision. The decision was cancelled by the Communist Party's regional committee " because many Communists in the Institute had not attended the meeting in question and the decision was passed by a negligible majority of votes."

According to the Academic Council's meetings rota, Melchuk's re-election should have come up in November 1975. However, for reasons not stated it was several times put off until, eventually, it was set for 25 March 1976.

Composition of the Council (as given in Open letter, p. 138)

Minutes of the Meeting:

Before beginning the hearing of Melchuk's case, Director of the Linguistic Institute V. N. Yartseva ordered the removal from the hall of all " outsiders " (i.e. people who were not Institute members), after which she invited Melchuk to read his report on the work he had done in the last five years.

Melchuk: " Before I start, I'd like to ask one thing: there are some of my friends here who would very much like to be present, but they have been refused admission. Couldn't they be allowed in? "

Yartseva: " Igor Alexandrovich, this isn't a dissertation meeting; it's a normal working meeting attended, naturally, by the Members of the Council and, voluntarily, by the Institute's Staff. We must ask outsiders to leave the hall. It would be different had this been a conference report. But right now we have internal matters to settle."

Melchuk: " Even so, the Academic Council can't work in closed session. There are free seats, why can't they have them? "

Yartseva: " This is a disciplinary matter. I repeat: if this were a conference report, we'd inform other Seminars and Institutes. But only staff of the Institute concerned can attend current working meetings."

Melchuk: " But . . ."

Yartseva: " As to this meeting of the Council being closed—no, it's not a closed meeting. A closed meeting is one attended only by members of the Council. This one is open to Institute staff as well—so it can't be a closed meeting. It's an open current working meeting dealing with our own affairs. That is why we have not invited outsiders to it."

Melchuk: " I simply asked . . . as a favour. I quite understand that decisions of the Academic Council must be observed."

Yartseva: " No, this is not a Council decision; it is a matter of internal Institute discipline. Our own affairs must be settled without outsiders being present."

Melchuk: " I understand. I merely asked. . . ."

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MELCHUK'S REPORT:

His work in the years 1971–75.

Scientific work

Essential trends:

(a) further elaboration of the linguistic theory of "Meaning Versus Text";
(b) concrete language patterns within the framework of that theory;
(c) annotated bibliography on problems of automatic text processing.

(a) "Meaning Versus Text" Theory.

In accordance with the work plan for 1971–75 approved by the Directorate I published about 10 articles on "Meaning versus Text," including "Problems of choice in the non-unicality of morphological solutions" (morphology: science of form); "Presentation of Utterances and the general structure of the Meaning-Text pattern"; "Conversion as a morphological means," and others.

The first part of my planned monograph "Theory of Linguistic Meaning versus Text Patterns" appeared in 1974; but the second part of the monograph, sent for publication at the same time as the first, has not been published to this day (for reasons not known to me); and by now has become so antiquated that it could not be published without thorough prior revision. (It is important to note here that in 1971 the Fink Verlag Publishing House, Munich, offered via "Mezhdunarodnaya Kniga"—"International Book" Publishers—to publish the book *in toto*; but the Institute's Directorate would not allow me to hand over the manuscript to the "International Book" Publishers, as a result of which the manuscript—over 1,200 typewritten pages—is now to all practical purposes lost.)

(b) Concrete language patterns within the Meaning-Text theory:

In 1971–75 I published

(1) a number of encyclopaedic articles for an explanatory terms dictionary in collaboration with A. K. Zholkovsky, Yu. D. Apresyan and others.

(2) Description of English perfunctory syntax—in collaboration with N. V. Pertsov.

(3) Description of Russian uses of predicatives—in collaboration with L. L. Iomdin and N. V. Pertsov.

(4) Formal Russian noun and adjective patterns—in collaboration with N. A. Yeskova and V. Z. Sannikov.

(5) Verbal word changes and basic syntax.

Altogether in that time I published over 40 works; in addition, a number of books are at present under publication or about to be completed.

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(c) Annotated bibliography on problems of automatic text processes: 1964–70.

This monograph on computerized translation, prepared jointly with R. D. Ravich, has been under publication since 1972 and should have appeared before 1976. The current volume 1971–75 is ready, but has so far found no publisher.

Scientific-organizational work

In 1971–75 I lectured at a number of Conferences in the Soviet Union on

Problems of syntax in Indo-European languages, Leningrad, '71.
Terms and Terminology, Leningrad, '74.
All-Union Theoretical Conference on Linguistics, Moscow, '74.
Diathesis and Voice, Leningrad, '75.

At the Conference on "Inter-Action of natural and artificial Languages, Moscow, '72," I was lecturer and member of the Organizational Committee. In addition, I repeatedly gave lectures at various Institutes of the Soviet Academy of Sciences and higher educational establishments: the Institute for Communication of Information; the Institute for Administrative Problems; the Moscow Mathematical Society; at Seminars of Moscow University; in the Publishing Houses of "Science," "Soviet Encyclopaedia," etc.

Finally, I held a number of linguistic courses in several institutions of higher education throughout the USSR:
Novosibirsk State University (five times), Alma Ata Pedagogical Institute of foreign languages, Vilnius Pedagogical Institute of foreign languages, Odessa University; Tartus University; Friendship of Nations University; Moscow State Pedagogical Institute.

At the same time, between 1971 and 1975, I was often asked to take part in international conferences and symposia (frequently with the host side paying all the expenses); but not once did I receive the requisite permission to go. In particular, I was kept away from the following meetings:

International Conference for Computer Linguistics, Debreczen, '71.
Third International Congress on Logics, Methodology and Philosophy, Bucharest, '72.
Congress of Hungarian Language, Budapest, '72.
International Conference for Computer Linguistics, Pisa, '73 (I was one of two lecturers invited to attend).
International Congress of Linguists, Bologna, '74.
4th International Congress of Synthetic Intellect, Tiflis, '75.
International Conference on Humanitarian Sciences, Marseilles, '75 (this list is far from complete).

Participation in the above-mentioned conferences was not, and as a rule could not have been, planned in advance. Nevertheless, such

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a direct exchange of views and ideas is obviously invaluable to a scholar—so the circumstances which governed my absences from these meetings clearly had an adverse effect on my work. I was never allowed by the Directorate—and this in contravention of the USSR Academy of Sciences Presidium directive—to lecture at Kiev or Lvov University.

In 1971–75 I carried out the duties of Academic Secretary of the Structural and Applied Linguistics Department; I also frequently consulted representatives of various establishments and organizations (on problems of automatic text processing).

Senior research assistant, Soviet Academy of Sciences Linguistic Institute.

I. A. Melchuk.

Debate on Melchuk's Report

Yeliseyev (deputy director) explained that Melchuk was not allowed to send the manuscript of his book to West Germany for reasons of priority: "First it has to be published in the USSR and then—elsewhere, if anyone cares to do so." (The book still hasn't been published *in toto*.) He emphasized that the publication of many monographs is held up in the Institute: "There are manuscripts waiting to be published from 1960 still . . ." (Voices in the hall: "My book had to wait seven years!" "Mine are also constantly held up!" "And mine!")

Yartseva pointed out that Melchuk's trips abroad had been refused solely because there had been no advance notification.

Kotov (Doctor of Technical Sciences, retired Colonel in charge of the Structural and Applied Linguistics Department where Melchuk worked, was appointed to the post two years ago in place of A. A. Reformatsky): "Your subject—research into possibilities of Anglo-Russian computer translations—what happened to that?"

Melchuk replied that the creation of a workable machine system had never been part of his task, since he had never had a computer at his disposal. His aim was to research into the *linguistic* possibilities of such a system, with which his works, listed earlier, had in fact concerned themselves.

Rastorguyeva (Head of Iranian Language Department) asked how the work done by Melchuk could promote that objective?

Melchuk explained that what he had tried to do was to evolve ways and means that would yield a form applicable to concrete language material. It was difficult and, in fact, unsuitable to plan monographs much in advance in this field: publication, if it happened at all, took too long and then the treatment of the subject tended to become obsolete. The best way to indicate results was in articles and preliminary publications.

Yeliseyev: "Igor Alexandrovich's work has been fully dealt with in

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his report. But what about the social-political side? What about attendances at Methodological Seminars, at political lectures? " (At Methodological Seminars, Institute staff must acquaint themselves with Party press articles on questions of Marxist philosophy, the Party's foreign policy, various aspects of politics and economics—as well as material from classics of Marxism-Leninism, Leonid Brezhnev's writings included.)

Gukhman: " You, Igor Alexandrovich, have taken no part whatever in our social-political life! "

Melchuk: " I'm sorry—but nobody can say I have ever refused to do my duty or ever failed to help anyone in need. In my time I have been sports organiser, chairman of the DOSAAF Committee (patriotic society of the three Armed Forces) and have delivered lectures. True, in recent years no one has approached me with any requests: evidently my services are no longer wanted . . . and I don't like to push myself. It is also true that I did not go very often to Methodological Seminars, since I was heavily preoccupied with my own work. Besides, the themes at these Seminars are of little interest to me. I believe that participation in them should be on a voluntary basis."

Yartseva: " Oh no—Methodological Seminars are extremely important, training staff in political ideology."

Khaidakov: " Did you attend the more recent meetings of the Seminar? "

Melchuk: " No, I did not. These Seminars are held during working hours when I have my own job to do."

Gukhman: " Did you know you were the only member of the Institute who didn't show up at these Seminars? "

Melchuk: " No, I didn't know that. And I find it extremely odd that I should be the only one to find them uninteresting."

Yartseva: " The report on your work is one thing. Participation in the Institute's social-political life is another. Your absence from the latter had already been noticed by us earlier. For some time now not only the social organizations (i.e. the Institute's Party Bureau) but also members of the Directorate repeatedly had occasion to talk to Igor Alexandrovich about those pronouncements of his in the Soviet Union which had been exploited abroad to the detriment of our country. (Yartseva is referring to letters sent to the Party Central Committee and the Soviet Premier about the Sinyavsky-Daniel trials (1966) and the Ginsburg-Galanskov one in 1968; these letters, signed among others by Melchuk, did not defend the accused; they merely asked the Government to show maximum clemency.) Now I have to inform you of the following. On 25 January 1976, the *New York Times* carried a letter signed by Igor Alexandrovich. At a meeting of the Directorate a week ago we spoke to Melchuk (18.3.76). This conversation depressed us all. We tried to make him see that every Soviet scholar and scientist constantly represents the Soviet Union not only in the scientific sense

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but in the moral-political sense as well. We asked him to say where he stood in this matter and to explain the reasons that prompted him to send to the United States a letter discrediting our country. This is disgraceful conduct by a member of our Institute. Our Institute is an ideological one. Hence Melchuk's conduct cannot be ignored. I consider it necessary to inform our Academic Council of this conduct which is impermissible not only within our Institute but within the Soviet Union as a whole."

Kotov: "I have been in charge of the Structural and Applied Linguistics Department for two years now and must say that the conflict arose already last autumn in connection with Melchuk's report . . . which is a mixture of results of academic work and insults and grievances directed against the Institute's leadership and the Party Bureau. I refused to pass his report and for a long time I and others tried to prevail upon him to keep these two matters separate. He refused to revise his report. In answer to the Directorate's decision that he should re-write his report, Melchuk preferred to give an ultimatum. Yet he has enjoyed many perks in his time, which other members of staff did not: he was free to organize his work as he chose; he was free to come and go as he liked, and so on. This still wasn't enough for him. As for his work, he has indeed published many books. However, all his efforts are directed at substituting industrial systems of automatic translation for research into general or theoretical linguistics. Such substitution can do nothing but harm. Outside the Academy—i.e. in circles connected with practical uses of linguistics, Melchuk carries no weight. Thus, in 1973, he was not included in the State Commission for the practical realization of computer translations." (In point of fact, Melchuk was included in the above-mentioned Commission. He was first approached by a member of the State Committee for Science and Technology—a certain Tsoy; Melchuk agreed. But after talks between Tsoy and the Institute's Directorate, Melchuk was removed from the Commission, no doubt for political reasons.) "In my view" (Kotov went on), "Melchuk ought not to pursue a policy of scientific expansionism, substituting pure theory for applied method. Also, he ought to go in for greater critical self-appraisal. Judging by his speech at the All-Union Theoretical Conference 1974—a 40-minute-long report containing nothing of scientific interest—it is not surprising he hasn't been sent to other Conferences. How can anyone in charge allow a lecturer like him to speak anywhere at all?" (At the Conference mentioned by Kotov the Organizing Committee had, the day before the meeting, without any prior warning, withdrawn a number of reports passed a year earlier—including one of Melchuk's. When Melchuk rose to read another report—a joint one with O. S. Kulagina, who did not attend—he preceded it with a ten-minute attack on the Organizing Committee of which R. G. Kotov was a member. . . . After that he proceeded to

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deliver his report, disregarding the protests of the chairman—again R. G. Kotov.)

Gukhman: "The work of a Soviet scientist cannot be assessed within narrow academic confines. One must assess his academic contributions as well as his adherence to a certain ethical code. After all, a Soviet scholar must be governed by ethics above all. Melchuk's report is a purely academic one. Yet not so long ago he appeared on the pages of the American press with a letter which slanders our country, our way of life, our ideology, our politics. The policy of *détente*, carried out by our Party and Government, has in no way blunted the acuteness of the ideological struggle; on the contrary: it has intensified it. Igor Alexandrovich is a mature adult; he must understand that this struggle against Soviet ideology harms not only our country, but the cause of all progressive mankind. In the present-day situation, any discrediting of Communist ideology is grist to the imperialist propaganda mill. Igor Alexandrovich has committed errors before. But we were patient—too patient, perhaps. He has now committed a hostile act which precludes his continuing presence in the Institute."

Voice from the Audience: "Could we not be told the contents of Igor Alexandrovich's letter?"

Melchuk: "After the Academic Council's vote and verdict—which I'm sure is pre-determined, anyway—I am prepared to read my letter and provide any explanation that may be required. But I should not like to do so *before* the vote. The point is that I feel it's utterly wrong to put the question of my re-election side by side with my letter to the *New York Times*. In this context I should quote from a document, the International Pact on Civic and Political Rights (passed at the 21st Session of the UN General Assembly of 16.12.1966: its Art. 19 says: 'Each person has the right to the free expression of his views . . . including the freedom of disseminating information and ideas—irrespective of state frontiers—orally, in writing and through the media of the press or other means.' This Pact was ratified by the Soviet Government and, consequently, became Soviet law . . . having, besides, priority over our own, i.e. domestic, laws. Thus, by writing a letter to the *New York Times*, I merely made use of my legitimate rights without breaking the law in any way."

Yartseva: "Surely the rights and obligations of members of the Academic Council do not diverge from the rights and duties of all Soviet citizens?"

Yeliseyev: "By way of explanation let me say that in accordance with the directives of the Higher Examination Board a scientist must not only be a highly qualified expert in his field; he must also be without blemish in the moral-political sense. (Went on to read appropriate paragraph to the effect that Soviet patriotism and internationalism are the inalienable traits of a Soviet scientist.) Hence one cannot, by referring to some Pact or other, hope to stem criticism of

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a scientist and confine it strictly to the narrow academic side of his activity. Igor Alexandrovich also tried at the Directorate meeting a week ago to present matters in such a way as though all this was his own affair. Yet we know that his latest attack on Soviet ideology isn't all: one could cite a whole string of facts—letters in defence of Sinyavsky and Daniel, Duwakin (Moscow University Lecturer, the only defence witness at the Sinyavsky-Daniel trial); and the events in Czechoslovakia. And still Igor Alexandrovich believes it's his own affair and nothing to do with us? What about your admissions in the past that you had indeed acted wrongly? How do you now explain that you address yourself directly to the West, thereby enabling ideologically hostile radio stations to comment on your letter? "

Melchuk: " Yes—I have indeed in the past expressed regret over things I said. I did so solely under pressure: pressure of fear. I was a coward. But I'm tired of being afraid. Now I'm afraid no longer."

Maitinskaya (Professor, Ugro-Finnic Section): " I don't go in for computerised translations myself but I remember how at one time you talked about it at great length, promising so much! Now everybody has turned against this particular process which in any case is too expensive. So where is your computer translation system? Your earlier promises, one feels, have remained unfulfilled."

Melchuk: " I find it embarrassing to justify and praise my own work findings—but in order to dispel any possible doubts, let me read an excerpt from a letter by D. Walker, chairman of the Linguistics Committee at the International Federation of Documentation, addressed to V. N. Yartseva and the Presidium of the Soviet Academy of Sciences (4.12.75)—inviting me to the Linguistics Seminar in Stockholm, 3–5 May 1976: ' I am instructed by the Committee to extend an invitation to Igor Alexandrovich Melchuk to attend the Seminar. His unique qualifications would make his presence particularly valuable. All expenses incurred will be paid by the organizers of the Seminar.' I have other, similar, letters here from various countries. I would have thought they constituted some proof that I hadn't exactly wasted my time at the Institute."

Yeliseyev: " We were asked about the content of Melchuk's letter in the *New York Times. I myself haven't read it* (emphasized by author of this text), but as far as I know it is written in support of A. Sakharov and makes three points: (1) Soviet citizens have no chance to express their opinions; (2) Dissidents are persecuted; they are held in prisons and mental clinics; (3) Soviet public opinion is wrong in condemning Sakharov. Melchuk protests strongly against what he calls the anti-Sakharov witch-hunt—against a man whom Melchuk considers a Soviet scientist of utmost integrity. . . . (Shout from the audience: ' Shame! ') While we urge peace and *détente*, Sakharov calls on the West to be firm—i.e. demands a return to the cold war. Only a few days ago we heard a speaker on the international situation explain the total fallacy

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of Sakharov's position. In Melchuk's view, Soviet ideology should be attacked simultaneously from the West and from inside the Soviet Union."

Khaidakov (chairman of the local T.U. Committee): "The talk we had with Igor Alexandrovich at the Directorate meeting left me also feeling quite depressed. Once a man has reached a certain age, it's time he looked back—for we learn from our past mistakes. Mistakes of a scientific nature are one thing; ideological ones are something entirely different: they are terrible. And errors committed against the very foundation of Soviet society must be particularly severely assessed. Melchuk chose for his letter a newspaper which is the bulwark of the most reactionary layer in the United States—the extreme right-wing imperialists. One would have felt less strongly had he sent his letter to, say, the *Morning Star* which, though a Communist paper, prints material from various bourgeois sources, but at least progressive ones. At the Directorate meeting we were unable to convince Igor Alexandrovich that he had acted wrongly. He called all of us 'conformists,' i.e. people who adapt themselves to a given situation and act on orders from above. Igor Alexandrovich, you stand on the edge of a precipice! We have tried to pull you back! "

Yartseva: "You have become a puppet in some unholy hands. . . ."

Gadzhieva (chairman, Popular Control Committee): "I, too, was deeply depressed by everything that happened at the Directorate meeting. I had hoped to hear words of repentance; all I heard was his profound conviction of being right. Your actions border on propagandist warfare—and under the Soviet Constitution this is a crime. It grieves me that we have lost you."

Desheriev (Head of Socio-Linguistics): "We all find these proceedings unpleasant. We all would like to see Igor Alexandrovich on our side in all respects: in the scientific, social, moral-ethical sense. We are saddened not only by what you say and how you say it, but also because we haven't achieved anything with you. Each academic society has its rules; the rules of the USSR Academy of Sciences demands patriotic and moral-ethical conduct.

There is one thing I'm not clear about. For years you have worked on computer translation. Yet what practical uses did you discover? You say you have had no machine. But remember, a long time ago, when I was deputy director, I managed to get you a computer from the Academy's Supplies Services—and you wouldn't take it, saying you were not yet ready for it. And now?

You have acted unfairly in many respects. As a Soviet man, you should have first given matters some thought, considered all the implications and consequences. This is not a question of right. You have the right. This is a question of one's duty, one's obligation."

Chemodanov (retired Professor, philological consultant to Progress Publishing House (husband of M. M. Gukhman)): "I have known

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Melchuk 26 years, since our University days. I know him from his work for *Progress*. (Turning to Melchuk) I have always treated you well. And although *you are arrogant* (emphasized by author of this text), I have given you a lot of work, despite your difficult character. (He lists a number of books Melchuk translated for *Progress* or in the translation of which he was involved.) As for your report, two things strike one about that:

(1) You say that your books aren't published—and at the same time you point out that in 20 years you have had published 150 works. Happy the man who gets that much in print! It's very a rare thing to happen in academic Institutes. (Explanation: Chemodanov himself has had hardly anything published. As for Melchuk's works, they have not appeared for a long time in central linguistic journals such as *Questions of Linguistics*. Most of them appeared in specialized, non-linguistic, publications, or in very small editions as reprints (100–150 copies); or abroad. Not a single work of Melchuk's has appeared in the publications of the Linguistics Institute.)

(2) Of course all this is our affair! You just try anywhere in the West, say in West Germany, to advocate a Communist viewpoint! A Communist wouldn't last a day in a Civil Service job. . . . So why should we let you get away with the things you say?

It doesn't matter whether your theories are a success or not. One's scientific position and political position are not one and the same thing. R. Yakobson and N. Trubetskoy are also ideologically opposed to us; but we quote them. You mustn't confuse the two things. Here, within the walls of the Institute where I am a member of the Academic Council, you speak out in hostile fashion against all I have served for many years. I shall vote against your re-election! "

Yartseva: " I should like to add that there hasn't been an instance when an article by I. A. Melchuk, destined for abroad, was not sent off by the Directorate. (Note: That is so—but this applied invariably to already published or 'semi-published,' i.e. in pre-print, articles. Sending off unpublished articles required submitting four copies of the English text, four copies of the Russian translation; and proof that original and translation are one and the same thing—i.e. not a translation of something else. After that one has to wait a long time for the manuscript to pass the censors.)

It is true, (Yartseva went on) we didn't send I.A. abroad. That's because every Soviet scientist represents our system and our ideology. And I.A. always stressed that 'this is my own, my personal, view.' The monolithic nature of the Soviet State and of its people does not permit such a division: 'that's me, that's what I think . . . the rest have nothing to do with me. . . .' We can't have that. Either Melchuk helps us, is with us, or he is not. Then he is with those that are against us. And at the Directorate Meeting we felt he was no longer with us. A member of the Institute must be our own man. Also, Igor

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Alexandrovich is wrong when he says that the Council's vote is pre-determined."

Melchuk: " Viktoria Nikolaevna, let's have a bet for 10 Roubles that the vote will go against me. . . ? "

Yartseva: " Nothing is ever pre-determined. The decision of the Academic Council is a matter of conscience for each one of its members. For years we tried to keep you with us—but you treated us badly. You don't respect our team. We could have helped you to stay with us—but you don't want that. All that has happened is your fault, not ours. I can't agree with what you have said. We know full well that the world is split in two—and you turn towards our enemies! I believe this open discussion has been useful."

Melchuk asks for a last word.

Yartseva: " You were given an opportunity to speak so that no one should be left with prejudiced ideas. This frank and open discussion shows clearly that we treated you with respect. We listened to what you had to say and I believe the situation is now clear to everybody. We have other business to attend to."

Chemodanov: " There is a definite procedure. It's all quite clear."

Melchuk: " In the courtroom even the defendant is allowed a last word! "

Yartseva: " Next item on the Agenda . . . "

(results of vote: Open Letter, p. 138).

Anonymous

Translated by Lydia Seward.

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An Open Letter from Igor Melchuk to his Colleagues*

Dear Colleagues,

At the meeting of the Academic Council of the Institute of Linguistics of the Soviet Academy of Sciences of 25 March 1976, I failed to be re-elected to the post of senior research assistant which I had held until then. (According to the rules of the Soviet Academy of Sciences, every assistant of the Academy's Institutes—junior ones every three years, senior ones every five years—has to come up for re-election before the Academic Council of the appropriate Institute. This is generally a matter of routine and often not even attended by the person seeking re-election. In cases of non-re-election, the person in question must be dismissed within the following year.)

The composition of the Academic Council investigating my case was as follows:

> V. N. Yartseva (the Institute's Director); Yu. S. Yeliseyev (Deputy Director); V. A. Yefimov (Secretary); V. D. Arakin; N. A. Baskakov; T. A. Bertagayev; I. F. Vardul; N. Z. Gadzhiyeva; M. M. Gukhman; Yu. D. Desheriyev; G. A. Klimov; R. G. Kotov; G. V. Kolshansky; M. A. Kumakhov; K. E. Maitinskaya; S. A. Mironov; K. M. Musayev; V. S. Rastorguyeva; N. A. Slyusareva; E. R. Tenishev; O. N. Trubachev; N. S. Chemodanov; A. D. Shveitzer; and S. M. Khaidakov.

Results of the secret vote: 19 against my re-election; two in favour; three voting slips were declared invalid (which, in fact, is tantamount to abstention). I was then informed by the Institute's Deputy Director, Yuri Yeliseyev, that I must consider myself dismissed as from 18 May 1976.

I had worked in the Soviet Academy of Sciences Linguistic Institute since 1956. In that time I had published over 150 works, including a number of monographs; many of my books have been translated and published in the United States, France, Spain, West Germany, Poland, Hungary, East Germany and so on. I had been repeatedly asked to attend international linguistic conferences, to deliver lectures and to join the editorial board of foreign linguistic journals.

Even so, the Academic Council of my Institute did not deem me worthy to continue in my post. The only—and openly admitted—reason for this was the publication of a letter from me in the *New York Times* of 26 January 1976 in which I expressed my disagreement with the Soviet press campaign being waged against Prof. Andrei Sakharov and

* An almost complete translation of this letter appeared in the *Los Angeles Times* of 14.8.1976.

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protested against the politically motivated arrest and conviction of the eminent bio-physicist Sergei Kovalyov (sentenced to seven years in a " strict regime " labour camp, followed by three years' exile).

Yet the Soviet Union did, in fact, ratify an international Pact on civic and political rights (passed on 16 December 1966 at the 21st Session of the UN General Assembly) which had thus, in accordance with Soviet legislation (Art. 569, RSFSR Civil Code) become Soviet law. Art. 19 of the above mentioned Pact entitles me to the free expression of my views and the free dissemination of all information and ideas orally, in writing and through the press media. Consequently, by sending my letter to the *New York Times,* I had in no way broken my country's laws. (But even if I had, I would then have had to account to the organs of justice, not the Academic Council of the Academy of Sciences Linguistic Institute.)

In spite of this, the speakers at the Academic Council meeting declared that (what they said is recorded on tape) ". . . Igor Melchuk has discredited our country and brought shame on the Institute's staff . . . His conduct was impermissible not only within the Institute but within our country as a whole." (Yartseva, Director.) " By his slanders, Melchuk has done harm not only to our country but to the cause of all progressive mankind. . . . Thus, his hostile act precludes his continued presence in the Linguistic Institute " (M. Gukhman). ". . . In vain does Melchuk, by referring to some sort of (sic!) Pact, try to avert criticism of an academic's moral-political stance." (Yu. Yeliseyev.) ". . . Melchuk's words border on propagandist warfare . . . his entire conduct has been heavily incriminating. . . . We had hoped to hear words of repentance: all we heard were his continued strong, and wrong, convictions." (N. Gadzhieva): etc., etc., etc. All these feelings were finally summed up by the Institute's Director, V. N. Yartseva, when she said: " The world is split in two . . . and Igor Melchuk addresses himself to our enemies."

I had always believed that over a working span of 20 years in the Institute I had made a number of friends to whom I was bound not just through the ties of work but through ordinary, warm, human relationship ties as well. Yet may I say that not a single colleague chose to speak up in my support or even to say a few words of comfort. Nor, as far as I know, has a single Soviet Academician (not counting my personal friends) thought it necessary or possible to speak up in my defence.

The purely political nature of my dismissal now makes it impossible for me to find a position anywhere else in the Soviet Union—all the more so since even before the Academic Council's decision my situation in the world of Soviet science had been an uneasy one. In recent years I have been virtually deprived of the opportunity to publish my work in leading Soviet linguistic journals. Passing any article of mine implied actual heroism on the part of an editor. The second volume of my

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monograph "Meaning versus Text in Linguistics" (the outcome of years of work) had been awaiting publication for over six years . . . and in the end remained unpublished. I was, and am, forbidden to teach, to attend conferences, to go abroad in order to contact foreign colleagues. And as soon as my letter appeared in the *New York Times*, Soviet journals and publishers started to eliminate other authors' references to my works in their own books (e.g., C. Ya. Fokin, chief editor of a journal called "Scientific-technical information"); my name was even removed as editor and translator (N. C. Chemodanov, K. T. Bogdanova, "Progress" publication.)

In conditions such as these, and without a permanent place of work, I am totally deprived of any chance of pursuing my occupation. This puts before me a tragic choice: either meaningless vegetation in my own country—which does not want my services; or—emigration: that is to say, irreversible (under Soviet law) severance from my homeland, and from all those who are near and dear to me.

Of course I realize perfectly well that my situation is in no way comparable with the situation of those who have lost their freedom and who languish in Soviet camps and prisons, their lives and health imminently threatened. And if I make this public appeal it is because I, personally, do not matter. What matters is that my case is a small but eloquent illustration of the life endured by the "cream" of Soviet society—what is referred to as the Soviet Intelligentsia. It is one more stroke of the pen in the monstrous chronicle of betrayals, toadyings and grovellings so lightly indulged in by some people in the USSR—people who hold important academic titles, people who occupy some of the highest rungs in the academic hierarchy.

The purpose of my letter is to compel the reader once more to give serious thought to the fate of Soviet scientists and scholars who are forced to choose between malevolence at home and emigration abroad. And yet—happy days! not so long ago their choice lay between enduring malevolence or getting a bullet through their head; or, at best, years behind barbed wire. Please do not ever forget that each one of them—with the exception of a few active fighters like Andrei Sakharov or I. R. Shafarevich—is either the victim or the henchman; or, worst of all, the henchman's tacit accomplice.

Moscow, undated—sometime between 8 and 14 April 1976.
I. A. Melchuk,
USSR 107207 Moscow B 207,
Baikatskaya Street 40/17, Apt. 113.

Translated by Lydia Seward.

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Samizdat

A View from Inside

Three Letters on Soviet Science

Mark Popovsky

I

I DO not know whether it has been observed in the West, but we in Russia are constantly aware of the continuous presence of a certain degree of conflict and of tension between Soviet science and international science. Periods of slight frost give way to thaws, sometimes to more severe frosts; but there has never, to the memory of my generation, been a normal, equable climate in the scientific sphere, for here the weather is determined not in laboratories or institutes but in the offices of Party workers, and the climate depends exclusively on the general political atmosphere prevailing in the country at the time. Towards the end of Stalin's reign, during the Cold War, Russian scientific chauvinism gave birth to monstrosities. One only had to open a newspaper or switch on the radio in those years to learn, for instance, that the science of cybernetics was an expression of the vilest and most insidious aspirations of imperialism, or that formal geneticists had only invented genes and chromosomes because they had found themselves incapable of apprehending the world in all its complexity, not having mastered the saving theory of dialectical materialism.

There are those who argue that the era of extremes is over, that nowadays, with the advent of joint Soviet-American space flights, it is meaningless to speak of any antagonism between Soviet and world science. But is this the case? There has been a real change in scientific policy in the Soviet Union during the epoch of *détente*. This was disclosed to me only very recently by the editor-in-chief of the *Znanie* [1] publishing-house, Alexander Alexandrovich Marinov, formerly a colonel in the Main Political Directorate of the Soviet Army.

Our conversation was no casual and fleeting exchange. I had a contract with *Znanie* for a publicistic book entitled *Zachem uchenomu sovest'* [Why the scientist should have a conscience]; it had taken them over two years to prepare a final manuscript version. New demands of a political nature were continually being made upon its author. As usual, on this occasion I saw yet another 15 pages of my long-suffering manuscript lying on Marinov's desk—pages I would be categorically

[1] A publishing-house specializing in popular scientific and scientific-propagandist literature (Author's note).

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required to cut. The following passage from the book had roused the editor-in-chief to particularly passionate indignation:

> In 1920, Petrograd physicists sent the People's Commissar for Education in Moscow a Memorandum which said, amongst other things: " . . . Science is essentially an international phenomenon. It is the result of the collective experience of the whole of mankind and, if it is to develop uninterruptedly, requires the continuous interaction of people, and in particular of learned specialists in all countries. This interaction is necessary in order that each country may immediately profit by scientific discoveries made in other countries. Any country which isolates itself is doomed to scientific backwardness, scientific stagnation."

To this quotation I had added that life had demonstrated again and again the need for and the inevitability of free contact between scientists, and for the free flow of ideas, discoveries and achievements.

These last lines of mine had been thickly blue-pencilled by the editor and a note had been scribbled in the margin: " Without limits? No state or military secrets for you—only freedom? " Sarcasm simply gushed from the editor's pen. I sat there and hung my head. At this juncture, obviously stricken with sympathy for his brow-beaten author, the editor launched into a speech. He spoke in a confiding, heartfelt manner, clearly eager to help me comprehend the wisdom of state policy.

" Your mistake is that you take the slogans of international *détente* too literally," said Marinov. " Yes, we are indeed making them an offer to trade and to exchange scientific ideas, but it isn't as simple as you seem to think. . . . You see, we have interests *of our own*; after all, we are a socialist state and we cannot forget about the predatory nature of capitalism. . . ." Becoming quite carried away, he leaned over his desk and, for some reason lowering his voice to a whisper although we were alone in the office, he added:

> They told us plainly at a propagandists' meeting in the Central Committee: the aim of scientific contacts with the West is this and only this—to get as much as possible from them and to give them as little as possible. Of course, we do need some Western discoveries and Western technology, but we certainly have no intention of collaborating with them on an equal footing. . . . Do you get it? The Central Committee says: no absent-mindedness, no rose-coloured spectacles! And you write " . . . the need for and inevitability of free contacts. . . ."

His expression was one of profound reproach. He was gazing at me with the look a schoolboy is given when he brings home yet another bad mark in his book. Colonel Marinov was patently grieved by my political immaturity.

The revelations of this Party propagandist of 30 years' standing are entirely credible. All he did was to blurt out certain mechanics that

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were already obvious enough. The Soviet authorities have been compelled by force of political circumstance to enter into international contacts, including scientific contact, but at the same time they do not want this to lead to any form of individual intimacy between Soviet and foreign citizens. They do not tolerate any individual initiative on the part of their own scientists. All activities must be planned in advance and must take place under official auspices. There must be no unorganized, private ventures. This traditional state policy is inculcated daily upon the consciousness of the mass of working scientists. Translated into everyday language, it runs as follows:

> Don't trust foreigners, the foreigner is always a secret enemy; international cooperation, the Apollo-Soyuz mission, the Pugwash Conferences are all top-level politics and nothing more. But here, among scientists, we must be particularly cautious in our relations with foreign scientists and always bear in mind the dangers with which such contacts are fraught.

The vast majority of working scientists in the USSR accept this directive without a murmur. Because of the poor quality of their scientific output, they feel no need for contact with the West: such encounters only expose their backwardness. But in the Soviet Union there are also creative people, real scholars whom I would describe as men of science, as distinct from the vast majority of run of the mill scientists. For the men of science, meetings with foreign colleagues, correspondence and attendance at international symposia are absolutely essential. Lack of contact threatens to keep them back as scientific provincials. Of course, there are not all that many productive, talented researchers among the general mass of working scientists. However, even Soviet sociological statistics acknowledge that 50 per cent of all research in the Soviet Union is carried out by 10 per cent of researchers. It is this 10 or 15 per cent, the most creative members of the million-strong army of Soviet research scientists, that is suffering the worst casualties under the government's policy of pseudo-*détente*. I could call upon any number of examples; I shall confine myself to the first two that come to mind.

Vadim Minukhin, a Candidate of Sciences and a member of the All-Union Scientific Research Institute For Geophysical Prospecting Methods, attached to the USSR Ministry of Geology, was working on a topic which was to form his dissertation. His research was nearing completion, and Minukhin published a summary of it in a Soviet scientific journal. The article must have contained interesting new data or techniques, because it was noticed abroad and translated, and its author received a letter from Los Angeles. Experts in an American laboratory expressed their appreciation of the merits of the Moscow geophysicist's ideas and were inviting him to collaborate with them. They indicated that the Russian had made more headway in his research than they had in Los Angeles, and that henceforth it would make

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sense for geophysicists in both countries to combine their efforts. The letter arrived at the Institute of Geophysics, but was not delivered to the scientist. Instead, he learned of its existence indirectly. At the next session of the Institute's academic council, the Director, Professor Mikhail Polishkov, reported that he had received a letter from the USA, the contents of which were patently *provocative*. The Americans were trying to divert Soviet geophysicists from the correct scientific path, and to this end they advised the development of an utterly impracticable research method. Collaboration with them would, of course, lead into a quagmire and set back research. The best solution would be to give up working altogether on the topic that interested the Americans. It must be thrown out, struck off the Institute's research programme for good.

Thus spake the Director, and the academic council obediently rubber-stamped his decision. The next day Vadim Minukhin discovered that no-one had any more need of his many years' work, his experiments and observations. They had been taken off the list of research studies on the grounds that they were unreliable and scientifically invalid. This being so, there could be no question of his defending a doctoral thesis on the topic. . . .[2]

My second illustration is an incident already known to American biologists from other sources. I refer to the Symposium on Tumour Immunology—held in Moscow in May 1976 in accordance with the Soviet-American agreement on scientific contacts. One might think that nothing could stand in the way of genuine, serious scientific discussion between American and Soviet oncologist-immunologists. Nevertheless, after the symposium the head of the American delegation William Terry, Deputy Director of the American National Cancer Center, was forced to make an official representation to the Soviet Ministry of Health about the behaviour of Academician Oganes Baroyan, the Director of the Gamaley Institute of Microbiology and Immunology in Moscow, who had done his best to hamper contact between Soviet and American immunologists. I questioned a group of Doctors of Sciences from the Gamaley Institute as to whether William Terry was right. " Yes, Doctor Terry was quite right. Baroyan ruined any attempt at discussion in the laboratory." " But why should he want to do that? " I asked.

> Because, as well as being Academician Oganes Baroyan of the USSR Academy of Medical Sciences, he is also Colonel Baroyan of the KGB and he is quite deliberately fighting against Soviet-American scientific contacts,

they explained to me.

> Contacts with our American colleagues enable us to get to know one another better and to understand and evaluate better the

[2] In July 1976 Vadim Minukhin emigrated from the Soviet Union.

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work being done by each side. Also, a Soviet scientist who is known abroad becomes more independent of his masters, of Baroyan, of the authorities, than a scientist whose work no one knows about. Like any other bureaucrat, the Institute's Director fears this kind of freedom most of all.

The chief requirement imposed on the scientist by the Soviet scientific administration is couched in exactly the same terms as the warning notices in tram-cars: " DON'T LEAN OUT." A ban is placed on any *individual* initiative, any action or gesture which might excite the interest of the world scientific community. Eminent biochemists the world over, including Nobel Prizewinners, evidently still recall the Seventh International Biochemical Congress held in Riga in the summer of 1970. The Congress heard over 200 papers, and foreign guests are said to cherish pleasant memories of the occasion. Perhaps our guests also remember the Congress's " host," Director of the Latvian Academy of Sciences' Institute of Organic Synthesis, Solomon Aaronovich Giller (1915–74).

Giller, whose work I have written about on several occasions, was one of the handful of Soviet scientists (there are only two or three of them in all) whose medicinal preparations have found their way on to the international market. This is no small achievement, bearing in mind that the Soviet drug industry is still in its infancy, that the population has for decades suffered from a dearth of pharmaceutical supplies, and that we are still purchasing the most vital preparations abroad. Notwithstanding, Giller sold one of his original preparations to Japan and another to Sweden (not on his own initiative, of course, but through official state foreign trade channels). For an anti-cancer drug synthesized in Riga the Japanese paid the Soviet Union 500,000 dollars, while the Swedes shelled out seven millions for a licence to manufacture the anti-epileptic drug mitandion. Giller returned from his trip abroad in high spirits. In just as high spirits he presented his report to the Presidium of the Latvian Academy of Sciences. His report was heard through to the end, but then, instead of the thanks he naturally expected, Giller received a severe rebuke. " Who gave permission for Academician Giller to reveal our Soviet scientific secrets to the capitalists? " the Academy's Vice-President enquired. The President then launched into a lengthy diatribe in which he told, among other things, of how he had been wounded at the front during the second world war and only penicillin could save him, but the hospital was in short supply. " And do you know why? Because the English had kept the structure of penicillin and the methods of manufacturing it a secret. . . . And now Academician Giller here goes to see these capitalists, bares his soul (for only 500,000 dollars! M.P.) and squanders the achievements of our science."

The myth about penicillin having been " classified " by the English is easily refuted. However, it is perhaps interesting to recall that only

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a year and a half earlier, the President of the Latvian Academy of Sciences had made a speech welcoming delegates to the Seventh International Biochemical Congress, a speech in which words about friendship, cooperation and the unity of scientists throughout the world were repeated over and over again. His speech may even have been published in newspapers abroad and have made a favourable impression. Now, 18 months later (with international *détente* going on), the same President was delivering, within the Praesidium of the Academy of Sciences, a speech whose driving spirit was directed wholly and exclusively against trust, cooperation and friendship. Naturally: in the Presidium, where there were no outsiders, one could say what one really thought.

Academician Giller reacted by behaving the way our scientists usually do in such situations. The authorities had barked at him: "Don't lean out!" but he did not remind them about scientific internationalism, about the fact that Fleming, Florey and Chain had refused to patent their discovery, which was the only reason why penicillin found its way into Russian field hospitals so quickly. "I was scared stiff when they took that line," Solomon Aaronovich admitted to me, "and I began trying to justify myself."

Even when leaving aside the international consequences, I can see in this constant intimidation of Russia's scientists and this stirring them up against foreigners the systematic destruction of the bases of scientific morality. Moreover, this forcibly instilled amoralism is felt most painfully by those very scientists who, by virtue of their eminent position in science, have a continual need for international contacts. I have heard of innumerable examples of the monstrous ingratitude shown by men of science towards state prohibitions and intimidation.

In May 1974 I spent a month in Krasnodar at the Institute for Agricultural Research. One day I was in the office of my old friend Academician Mikhail Ivanovich Khadzhinov, the principal character in several of my books, when a letter arrived from the United States. Professor R. J. Lambert of the University of Illinois was notifying Khadzhinov that he had dispatched to Krasnodar a series of seed specimens with the characteristics which his Soviet colleagues were particularly interested in.

This letter (postmarked Illinois, 29 April 1974) set my friend off on a train of melancholy reflections. He started to talk about how offensive our behaviour was towards foreign research scientists. Selection geneticists in the USA, France and England responded to any request made by our scientists. For us, though, to send selection material abroad was an agonizing problem. Approval from numerous quarters had to be obtained. If you were insufficiently persistent, the dispatch might get stuck in one of the sanctioning offices. But if you started pressing, Party officials would become suspicious about your request and prohibit the sending of the packet for political reasons.

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Listening to Academician Khadzhinov, I recalled another, similar case: some American geneticists appealed to geneticists in Kishinev to send them genes which caused the accelerated ripening of corn panicle, which the Moldavian selectionist Miku had discovered. However, the official Moldavian guardians of science flatly refused to allow the seeds to be sent to "the imperialists." And this despite the fact that all Soviet hybrid corn and all the selection work being done in the USSR with the aim of increasing the albumen content of corn seeds is based on American material—on seeds, types and strains sent by geneticists in the USA!

II

ACCORDING to certain calculations, the late twentieth century scientist obtains 70 per cent of his information via direct contacts, at meetings with his colleagues. Free scientific exchange has become one of the prime movers of modern science. It is also an antidote to all the misfortunes to which Soviet science is a prey. By and large, the Soviet scientist is deprived of international scientific contact. At a time of worldwide scientific dialogue we alone remain speechless. The fresh air of information and communication does somehow, with great difficulty, seep through barred and bolted doors to us. But this meagre ration condemns the more talented people to vegetation, mediocrity and apathy in their work.

In this atmosphere of semi-suffocation, even the most brilliant ideas of our scientists are either realized too late or not at all. It is now the fateful rule that original scientific thought sown in Russia only attains maturity and becomes public property abroad. The Soviet Union's scientific inferiority, about which Academician A. D. Sakharov recently wrote, is the direct consequence of lack of freedom in scientific commerce. When democratically minded members of the Moscow intelligentsia speak of this subject, it is the present regime they most often blame for everything. It would be more correct, however, to lay the blame on Russian state tradition in the sphere of scientific commerce.

During the reign of Boris Godunov (at the beginning of the seventeenth century) seven young men were sent abroad to study. Seven scions of ancient families were dispatched to foreign lands to master the science of medicine. The seven youths had been carefully chosen among many, sifted and assembled together. They had to be the most industrious and, more importantly, the most loyal. Nevertheless, none of the seven returned to Russia. Various reasons may be put forward for their failure to return, but of one at least we may be certain: the young doctors knew that they would not be let out a second time. Under Peter the First, fugitives were seized and brought back by force; under Catherine they were publicly cursed. And so ever since then—perhaps even earlier—the war of state power against lovers of freedom

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has been waged; that power refuses to allow two-legged livestock to slip through the sovereign's (or the state's) fingers, while generation after generation of freedom-lovers endeavour to break through the barrier and flee.

In 1839 this tendency was remarked upon by the Marquis de Custine. "In Russia," he wrote, "existence is beset with such constraints that it seems to me that each man cherishes the secret hope of departing wherever he may; but this hope is doomed to remain unrealized. Members of the gentry are given no passport, and the peasants have no money." [3] A third of a century later, when the regulations controlling travel abroad were a little less stringent, M. E. Saltykov-Shchedrin made the melancholy observation that "Reforms follow reforms, but the Russian still heads exultantly for foreign parts and continues to tantalize himself with the delights of life and customs there." [4]

Russian scientists were comparatively late in coming to feel the need for travel abroad for scientific purposes. However, when the need did arise at the beginning of the nineteenth century, the scientist came up at once against the traditional opposition of authority. Where did he wish to travel? Why? Even Academicians travelling for research purposes at the Academy's expense had to beg the Tsar's permission to leave the bounds of the Empire. An interesting document has been preserved—nowadays we would call it a *vyezdnoye delo*, an "application for foreign travel"—concerning N. Gamel, a Full Member of the Imperial Academy of Sciences. In 1833, Gamel submitted an application to Nicholas the First to be sent to the USA in order to acquaint himself with "the system of telegraphic communications by means of galvanic electricity." The Tsar sanctioned the trip, but indicated that the scientist could not leave the country until he had signed a statement that he "would not venture to take human flesh in his food, as is the custom in America." The Academician gave a written undertaking not to do so. One might dismiss this episode as an historical curiosity, were it not for the fact that obtaining permission to travel abroad from Russia has been, and still remains, just as distressing and degrading a procedure for scientists as it was for Academician Gamel, and indeed for scientists before him. A certain relaxation in state control over travel for scientific purposes did come in the last 30 years of the Empire's existence; but no sooner had the Soviet regime established itself than the situation reverted to that of the epoch preceding Tsar Alexey Fyodorovich.

During the first three or four years after the Revolution, the Bolsheviks allowed no one at all to leave the country. Members of the Academy of Sciences sent Maxim Gorky to see Lenin, but even

[3] Marquis de Custine, *Rossiya v 1839 godu* [*Russia in 1839*] izd-vo politkatorzhan, Moscow, 1930, p. 243.

[4] [footnote missing in Russian original].

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he was unable to persuade the Chairman of the Sovnarkom of the necessity for scientific contacts. Researchers only began to travel abroad after Academician Pavlov had sent Lenin a sharply-worded letter demanding to be allowed to live in England.[5]

" Alas, the fact cannot be concealed that a considerable number of our scientists have yielded to temptation and used their authority to travel in order to flee from their homeland . . . ," [6] the venerable Academician C. F. Oldenburg, a former Permanent Secretary of the Russian Academy of Sciences, was to sigh. However, by then the opportunity for temptation no longer existed: under Stalin, scarcely any specialists were allowed abroad, with the exception of a small number of production engineers. As for scientific contacts in the era of *détente*, our contemporaries can only envy Academician Gamel, whose fate, as far as travel abroad was concerned, was decided, after all, by only one person. Travel for scientific purposes today has become such a complicated business that it is doubtful whether anyone knows exactly how many people must nod their approval before a Soviet professor or Academician may cross the bounds of his fatherland.

It was in Vladivostok that I heard my first account of scientists' trips abroad. I was introduced to a research scientist in one of the institutes there, attractive, dark-eyed Galina L. In reply to my question the young woman gave an embarrassed laugh: " All my friends are Jewish or half-Jewish, and my mother too looks very Jewish; but God forbid that I should ever turn out to be a Jewess—they wouldn't take me on a single trip abroad—they might even fire me from my job." Galina is a biologist. Travel abroad to countries in the Pacific Ocean is an essential part of her work in the field. Nevertheless, each time she prepares an application to go abroad it is like navigating a string of reefs with danger at every turn. One trip almost fell through simply because her husband was corresponding with a foreign specialist. She was told so outright at one of her interviews.

Another condition of travel abroad (and one which, like all the others, does not appear in any code of laws) is that a scientist must not visit the same capitalist country *twice*. The only people who travel twice or more to the same country are those who are either employees of or collaborators with the KGB. Because of this condition, many useful and original joint projects with American, Swedish and Canadian biologists have fallen through. " They write to us and invite us, and we can't explain anything to them," said Galina. " After all, we can't write that all of us here are looked upon as potential spies and defectors. . . . When you get a letter your cheeks burn with shame. This is why many of our people have stopped corresponding with foreigners. . . ."

[5] Academician I. P. Pavlov's letter was published in full in the journal *Na literaturnom postu*, No. 20, 1927, pp. 32–39.

[6] S. F. Oldenburg, article in *Izvestiya*, 29 March 1928: " Maxim Gorky and the scientists."

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Let us assume, however, that everything is in order and the preparation of the necessary documents for your trip abroad is going smoothly. What do they talk about with you at the "private interviews"? Always the same thing: the purpose of your journey is to give nothing away to the foreigners but to prise, wheedle and extort as much as possible from them. Far from all scientists consent to this "programme," and those who evade it are not allowed abroad a second time.

There is one particularly tricky underwater reef that has to be negotiated during your "documentation." Everything is *lege artis*: your Party, professional and public testimonials are irreproachable, your family status is suitable—you are leaving your family behind as hostages—you have no relatives abroad, none of your family or friends has been repressed, none of your kith or kin were Jews . . . and yet you are refused! It appears that your well-intentioned colleagues abroad are to blame: to speed matters up and facilitate your trip, they have told the Soviet authorities that they are willing to cover the cost in full of the Soviet guest's stay in their country. KGB logic runs thus: "They are so insistent on inviting our man, that means they need him for something, they want to get some profit out of him. This mustn't happen. Let him stay at home." Sometimes KGB officials come to these conclusions even after all the documentation has been completed. This does not stop them: there have even been cases where a totally unsuspecting scientist has been taken off a ship minutes before sailing, or marched off an aircraft about to move down the runway. . . .

Another conversation I had on the subject of scientific travel abroad took place at the other end of the country, in Leningrad. Psychopharmacologist Izyaslav Petrovich Lapin, a professor at the Bekhterev Research Institute for Psychoneurology in Leningrad, is quite a different kettle of fish from humble Galina L. in Vladivostok. Immediately he crosses the threshold of Lapin's laboratory, the visitor is aware that here is a scientist of international standing. True, his laboratory, on the second floor of a shabby outbuilding, is cramped and poorly equipped, and the professor's study is even more cramped, but everything points to the occupant being a person of considerable repute. One only has to glance at the photographs on the walls: signed portraits with messages of great affection from the Nobel Prizewinner Professor G. Axelrod, Doctor Brodie, the founder of psychopharmacology, the famous Jose Delgado, and many others. "I have at least 200 friends abroad," says Izyaslav Petrovich, and, looking at his writing desk, it is easy to believe him. The letter-rack holds two bulging piles of letters with foreign stamps. One pile consists of requests for offprints of his articles, the other of invitations to attend symposia or deliver lectures.

Psychopharmacology is a young and fast-developing science at the

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meeting-point of psychiatry, physiology and chemistry. Discoveries in the field are springing up like mushrooms, and millions of people are interested in learning about them. It is not surprising that specialists in psychopharmacology are avid for contact with one another. Ideas in this branch of science crystallize with tremendous speed; hence the eagerness of scientists for more meetings with one another, including their colleague from Leningrad whose articles in specialist journals contain so much new and unexpected information. One would think that nothing ought to stand in the way of such meetings. But one would be wrong. Professor Lapin is one of eight members of the Committee of the World Psychiatric Association. For seven years now, the Committee, whose members are the most illustrious experts on the problem, has been meeting for twice-yearly conferences in places like Geneva, Paris or Prague. Representatives come from Germany, France, the USA and Great Britain. A Mexican and a Canadian also make their way to the conference hall. The only vacant place is that of the Russian delegate. It is always vacant. Perhaps he does not like noisy public meetings, this Doctor Lapin? But if so, let him come to Milan for the three-week Italian seminar for psychopharmacologists specially organized in his field. Doctor Silvio Garotti, the most eminent pharmacologist in the Apennine peninsula, has been inviting him for three years now. Or let him visit Boston, Massachusetts, where J. Mendelssohn, the Director of the Centre for Alcoholism and Drug Addiction, will welcome him with the greatest of pleasure. Doctor Mendelssohn has asked his Leningrad colleague on several occasions. To no avail—Professor Lapin does not come. Every day six or eight letters from abroad are delivered to him, but still he remains at home. Is he too busy? Is he ill?

"Whenever I get a letter containing an invitation," says Izyaslav Petrovich, "I feel what a man with artificial legs must feel when athlete friends thoughtlessly invite him to join them on the cinder track. I experience a deep sense of humiliation and helplessness, an involuntary inferiority which literally makes me ill."

Such is the strength of his emotions. But what exactly does the laboratory head do when he receives one of these invitations? He telephones the Institute Director and asks if he may see him about a private matter. If he is granted an audience he shows the Director the document he has received. The Director does not speak any foreign languages, so the laboratory head, who knows English, German, Italian, Polish and Hungarian, translates the text of the invitation for his benefit. "What do you want to go for?" the Director usually enquires. "Why is it suddenly Milan and Boston? Perhaps it would be better to start by going to Bratislava?" The laboratory head wouldn't mind going anywhere, even if only to Ryazan, but, after all, the invitation has come from Milan. If the

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Director is in a good mood he will gesture vaguely and say "Well—we'll see what we can do. . . ."

This is the signal for the start of the first round of negotiations. A photocopy of the Milan invitation, together with a translation into Russian and an accompanying document from the Institute is sent to the USSR Ministry of Health in Moscow. The Foreign Department of the Ministry will ascertain whether it is expedient for Professor Lapin to make the trip to Milan. The documentation has been sent and Professor Lapin waits in Leningrad. One month, two months, three months go by. The laboratory head goes to see the Director of the Institute again. "Better wait just a little longer," says the Director. "*One mustn't annoy them.*" "Them" is the Ministry's Foreign Department. Six months pass. The Director goes to Moscow. Cautiously he ascertains the fate of the documents which were sent, and discovers that it is by now too late for the Professor to travel—the Symposium is over.

However, sometimes a paper suddenly arrives from the bowels of the Ministry: "Send a 'foreign travel application.'" This in itself is an occasion for rejoicing. True, there are no guarantees, but, all the same, an official has consented to examine the scientist's application for permission to travel abroad. This second round of the contest involves obtaining and drawing up 12 documents: a certificate of good health, certified by six doctors, and a character reference, signed by three people and verified by the district Party committee and other such authorities. The prospective traveller is also expected to report to the district committee for a private discussion.

The discussion inside Party institutions is by far the most dramatic part of the process. Five or six pensioners, usually former bosses from the time of Stalin, put questions to the Professor: "How do you explain the fact that the USA has embarked upon political rapprochement with the USSR?" The correct answer must go as follows: "The USA has embarked upon a rapprochement with the USSR under pressure of the peaceloving policy of our state." If you do not know this formula you are told that you are not sufficiently mature to travel abroad. The Professor of Pharmacology is also obliged to answer these questions: "What is meant by chance in dialectical materialism?" "Who is Alvaro Cuñhal?" "What are the particular features of peaceful coexistence in its present phase?" The Party commission was not satisfied with Doctor Lapin's replies, and the scientist did not make the trip abroad. Nevertheless, Izyaslav Petrovich was lucky: they didn't make a mockery of him. One Leningrad student, a geographer whose university course included a sea journey to a foreign country, was asked: "In order to visit Dover for three days by ship you have to undergo a three-month check in seven stages, while all a Frenchman has to do is buy a ticket for the cross-Channel ferry. How will you reply if you are asked about this?"

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The student answered that he would not get into a conversation with foreigners on that subject; but his permission to travel was withdrawn. Apparently he ought to have given a different answer.... The Party committee and district committee may ask you about practically anything under the sun: What scientific qualifications does the Emperor of Japan possess? How many tons of steel were smelted in the USSR in 1970? Or even: Why did you separate from your wife? Experienced interviewees claim that it is not *what* you reply that is important but the manner in which you behave at the interrogation. If you answer brightly and cheerfully, that is excellent. But a dejected tone, an expression of displeasure on your face and reluctance to speak are regarded as heinous crimes by the Party committee members. However, the most dangerous response is an ironical or—God forbid!—a sarcastic one. District and Party committees find this unpardonable. Generally speaking, though, the chief aim of the entire charade is to humiliate a man who, in a few days' time, may possibly find himself *at liberty*. As a matter of fact, the fate of the scientist's application to travel is basically decided not there but at the KGB, who simultaneously receive copies of all the documents. Your interviews with the district and Party committees are simply a reminder: You are dependent on us, Professor, and don't you forget it!

As long as your "documentation" is being "processed" you cannot reply either "yes" or "no" to the invitation. The official recommendation on this score is not to write at all and not to reply to any letters. If, however, permission for your trip is refused, the Party organizations order you to "write that you are ill or too busy." This, too, is a test of your obedience.

Professor Lapin is in despair. He has ceased to believe that they will ever let him out—to Switzerland, to the USA or even to the Sixth World Psychiatry Congress to be held in September 1977 in Honolulu. These places are not for him. He has somehow (how exactly he has no idea) angered the authorities, and the way to the capitalist countries is closed to him. Surely, though, he can go to Poland—*our* Poland? There happens to be a symposium in Krakow on a problem that interests him. No, he cannot go to Poland either (1973). Or to visit a scientist friend of his in Warsaw? Refused (1974). In 1975 he went to Moscow, to No. 6 Ogarev Street, the Ministry of Internal Affairs. The General at the Ministry did not hide his bewilderment at the Professor's complaint. He even advanced his credo on the matter: "I wouldn't allow any professors and doctors to go anywhere at all. Because every professor has a hundred research students and friends in different countries. So, are we to let him go to a hundred countries?"

III

AMONG the artist Doré's illustrations to the Marquis de Custine's book over 100 years ago was one depicting how the Russian

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traveller goes abroad. Outward from the frontier post, Russians are shown bounding with the agility of young calves; on the return journey they drag themselves along as if to slaughter. The same change in spirits has been observed by many writers and travellers, including Herzen's friend Ogarev, whose name now graces the street where the USSR Ministry of Internal Affairs is housed. But whatever experiences lay in store for the traveller of Tsarist times who returned to his native land, he could not conceivably have imagined the sort of thing that recently happened in one Moscow research institute. Two research scientists, Candidates of Sciences, hoped to attend an international conference on ferromagnetic materials. Ferromagnetism is a fairly narrow and complex field, and these were the only two of the institute's members who knew enough about the problems which were to be discussed at the conference. However, at the last moment both scientists were refused permission to travel abroad. In their place, two Ministry officials were sent. The two officials understood very little about ferromagnetism, but one of them nevertheless read out the paper the scientists had written and even mumbled a thing or two in answer to questions that were put to him. Having enjoyed their fill of gallivanting abroad, the officials returned to Moscow, bringing with them conference materials and résumés. Making head or tail of them was beyond their competence, but the Academic Council of the Institute on whose behalf they had attended the conference demanded that they report on what they had seen and heard. For one moment—but only one moment—the two officials panicked. But they saved the situation very simply by summoning to their offices the experts who were under their command (yes, the very same ones whom they would not allow to go abroad) and ordering them to examine the documents they had brought home with them and deliver a report on the conference. Did they find it embarrassing? Ignominious? Nothing of the sort. Their audience, the Academic Council, felt no embarrassment, and the two scientists who read the report did not feel insulted. A normal episode in state-controlled science. . . .

Perhaps, though, all the people that I have mentioned—Candidate of Sciences L. from Vladivostok, Professor Lapin in Leningrad, and the Moscow ferromagnetism specialists—were victims of sheer bad luck—accidental, untypical bad luck? Perhaps the main body of scientists who need to travel abroad on scientific business do in fact do so, and thus no damage is done to scientific commerce or to the mental equilibrium of researchers? Such is the official version. . . . I have succeeded in obtaining some statistical information about the numbers of Soviet Academy of Sciences officers who travel abroad. Someone who worked for many years in the Presidium of the Academy told me that out of every 100 scientists who submit applications to travel outside the country on scientific missions no more than 10 actually go. The remainder are turned down flat,

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or their documents are "not completed in time," or their "application to travel" is lost, or . . . But in the final analysis what does it matter how the operation is performed? The result is the same: 90 out of 100 people do not travel. "Obviously, squashing so many hopes and stopping up so many mouths and ears requires considerable manpower," I conjectured. "Yes indeed," he agreed, and took out the Academy of Sciences annual handbook for 1975. Together we counted up the number of personnel within the Academy alone whose *duties consist in* blocking scientific contacts: there are at least 200 of them. (Just in the Department of Foreign Relations there are about 150 people.) I was given the details of how this army goes about its task, how it dissembles, cheats, deceives and humiliates those for whom foreign travel is *inexpedient*. It was all rather monotonous. Only two interesting details emerged. My informant described at length all the stages of the "processing of documents" (there are eight of them in the Academy) and told me that, unlike a travel application from other departments, that of a member of the Academy also gets sent to the CPSU Central Committee's Department of Science, is submitted to the Central Committee's Propaganda Department for approval and is screened at length by the KGB. Having enumerated all the snares and pitfalls, the man from the Presidium suddenly and quite seriously observed: "We are fighting against this disgrace." "Which disgrace?" I asked in amazement, imagining that scientists must in spite of everything be standing up for their right to travel freely in order to meet their colleagues abroad. But as it turned out what the Presidium of the Academy of Sciences of the USSR is fighting for is simply that prospective travellers should receive the necessary documents not on the eve of their departure, as they do at the moment, but at least two days earlier. Yes, they are fighting. But so far, unsuccessfully.

I also tried to question my enlightened companion on the expansion of scientific contacts in connexion with *détente*. It appeared that the matter of expanding contacts had been seriously discussed as early as the summer of 1973. At the time, not long before Brezhnev's visit to the USA, the Academy of Sciences had sent a group of physicists to America to prepare a scientific agreement "at the highest level." When the envoys returned, an exchange of opinions took place in the Presidium. As well as Academicians, the meeting was attended by KGB General Stepan Gavrilovich Korneyev, Head of the USSR Academy of Sciences' Department of Foreign Relations. The Americans had proposed what was then a fairly radical plan: to increase the scale of scientific exchange tenfold, i.e. instead of sending one American to the USSR and one Russian to America, 10 physicists were to be maintained in laboratories of the other country, and not for two months each, but for a whole year. This plan met with an objection on the part of General Korneyev.—The Americans spending

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a year in the Soviet Union, he asserted, would bring their families with them. This meant that Soviet scientists would have to be allowed to take their families to America with them. Supposing they suddenly . . . did a bunk? No—the Americans could bring their families here if they wished, but we would send our people on their own, and for four months only.

The General's wise decision seemed to satisfy everyone, but the trouble was that it would entail not 10 but 30 people travelling from the Soviet side each year, which was just as bad . . . Then one of the Academicians who had thus far taken no part in the proceedings sighed and said: "Good heavens, how much trouble this increased exchange programme will cause the American security organs, not to mention our own . . ." General Korneyev responded cheerfully: "No need to worry about that! If scientific contacts expand, they'll send us down extra staff from above too . . ."

After this the discussion of the problem of expanding scientific contacts proceeded more briskly, and soon the Academicians had decided on the most rational plan for an exchange programme.

General Korneyev is the most colourful personage in the sphere of Soviet science. His activities as a saboteur of every sort and kind of scientific contact will themselves sometime be, I am sure, a matter for specialized research. The younger scientists in the Academy call him a strangler, no less. But the General himself has a different opinion of his activities. After working for decades with Academicians, he too conceived a desire for academic glory. So what did he do? He defended a thesis for the degree of Candidate of Historical Sciences. His historic dissertation was received with rapture by the Academic Council of the Academy's Institute of Oriental Studies. Its title was—just guess!—"The International Connexions of the USSR Academy of Sciences." I visited the Institute of Oriental Studies in order to find out what new ideas General Korneyev had advanced in the field of scientific contacts. However, a professor I know there did not recommend going into the details. "The Academic Council members want to go abroad too," he said, "And anyway, it's all old hat now—the General is already on the point of completing a doctoral dissertation on the same topic. . . ."

Of course, the Soviet authorities are worried to a certain extent by the fear that a scientific researcher on a mission abroad will remain there permanently. They know, naturally, that the standard of living of a Doctor of Sciences in the USA is immeasurably better than that of his colleague in the Soviet Union. From their point of view one can only marvel—that so few Russian scientists visiting the West do actually stay there. However, in the final analysis, this is not the problem that most worries the KGB and Party officials who have charge of international scientific contacts. As well as interests of state, their own *personal* interest also enters into the matter. In the first

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place, a trip abroad is a dainty morsel to be offered only to scientists who show absolute obedience. In the second place—and most importantly—the officials themselves are very partial to it. It is not surprising that the organizers of international symposia in the USA, England or Japan time and again discover among their Soviet guests persons whose identity nobody knows and who no one has invited. For some reason the polite hosts feel it incumbent upon them to conceal their chagrin, especially since they are informed on each occasion that the scientists they had invited are, alas, ill. Such "illnesses" have been dogging our most distinguished mathematicians, physicists and biologists for many years already. Furthermore, there is no end in sight to these "illnesses."

At a recent symposium in the United States to which a group of Soviet chemists had been invited, the party which arrived turned out to consist of different people from the ones the Americans were expecting. The symposium organizers were prepared to voice a protest and stir up an international scandal. However, the leaders of the Soviet group begged their American colleagues not to make a fuss, because *it would make things even worse.* As it was, at least *some* serious scholars were getting through to symposia, but if protests were to start up, no one at all would be allowed out. The beauty of it was that this argument overwhelmed the Americans and they cancelled their protest. Freedom-lovers in their own country, they were afraid that the situation would become even worse *in Russia.*

No, no. No protests! At best the members of the World Psychiatric Association, when they next meet in Geneva with Professor Lapin missing as usual, will send a deeply-felt letter to him in Leningrad: "We are seated in the very same room where you should have been speaking this morning, and we are writing to you to underline our solidarity with you . . ." Solidarity is all well and good. But do the respected members of the World Psychiatric Association know that now, after the Helsinki Conference, it will be made even more difficult for a Soviet scholar to travel abroad to a scientific congress? Do they know that under the new regulations Professor Lapin will now need not only the permission of the Institute Director and the Party committee to travel abroad, but also the favourable decision of a Party meeting at the Institute? All Party members in the Institute must meet together and *pass a vote of confidence in the Professor.* That's what it's called in our country. And if some Institute porter or lift-operator raises an objection to the trip (and why should they not do so—after all, no one ever sends them to congresses!), the Professor will never get to see his European and American scientist friends.

Thus, the relaxation in the sphere of scientific contacts which the West so fervently hoped would come about in the wake of the Helsinki Agreements has now turned into a hardening of policy where scientific contact is concerned. Have those who plan science policy

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in the USA, West Germany, France and England noticed this paradox? Do they understand Moscow's real motives? I am very much afraid they have no clear picture on this score.

At every step we see the West come running to us with its scientific gifts. Russia takes the gifts but hisses an aside: " Beware the Greeks, even those who bear gifts." The West regards Soviet scientists as repositories of free will and Soviet science *en masse* as a part of world science. In Moscow, however, they only laugh at such naïvety. Every youthful laboratory assistant in our country knows that Soviet science as a social phenomenon has, unfortunately, been transformed into something quite different from what the West understands. Its main feature, and the one most prized by the authorities, is *tractability*. It is to preserve this tractability that the authorities in Russia are more and more firmly battening down the " window on Europe " which they sometimes open slightly for the sake of appearances.

The Soviet scientist on his way to an international conference has never felt master of his own fate (none of us ever say " I am going to a conference," but simply " they are sending me " or " they have given me permission "); he is the outright plaything of officialdom's whims and fancies. Towards the end of May 1976, my friend and the hero of one of my books Professor and pharmacologist Izrail Itskovich Brekhman came to Moscow from Vladivostok. Six months earlier he had received an invitation to speak at an International Conference on Pharmacology to be held in Singapore by the countries of the Western Pacific Ocean. Professor Brekhman had been especially invited as an expert on the pharmacology of the genus *Aralia* (ginseng, eleutherococcus). From Vladivostok to Singapore direct is not all that far; but for a Soviet scientist, wherever he lives, Moscow is the compulsory starting point for any foreign travel. So the Professor, whose " documentation " had been successfully completed, flew 9,000 kilometres from Vladivostok to Moscow to collect his papers. An obliging man, he presented himself at the Academy of Sciences' Directorate of Foreign Relations at exactly three o'clock that afternoon as he had been told. Everything was in order—passport, visa, currency, air tickets. Nevertheless, Professor Brekhman did not fly to Singapore. Two hours before he was due to leave, an important official at the Academy of Sciences gave the order prohibiting him from travelling abroad. The reason? None was given. Should he protest? Complain? But the plane to Delhi and Singapore was leaving in a couple of hours. All that remained for the scientist to do was set off home and fly the 9,000 kilometres back from Moscow to Vladivostok.

One may easily imagine that the same thing happened in Singapore as has already happened on many occasions elsewhere: at the appointed time, the chairman of the symposium announced that Professor Brekhman from the USSR would read his paper. Pausing for a second and seeing no Russian pharmacologist come on to the platform, the chairman announced half an hour's break before the

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next paper. "Russian time, gentlemen," he said, "Russian time." I don't know who invented the expression, but it has become firmly established at international scientific gatherings where Russian guests for some reason quite often fail to arrive.

With this I might end my discussion of the problem of international scientific contact. However there is another side to the question. Those American, British, German and other delegates to scientific symposia who sit patiently smoking away as they wait for the start of the next paper and with indulgent irony make fun of the Russians who, as Bismarck once said, "are slow to harness up," might do well to take a little more serious view of this chronic state of affairs. For, in the final analysis, Academician-Colonel Baroyan (see my *First Letter*) and the bureaucrats in General Korneyev's department are not only insulting Russian physicists, chemists and biologists; they are spitting in the face of the entire world scientific community. They are injuring the sense of morality of the five-million strong international republic of thinkers, discoverers and inventors on the planet Earth. Only once did I hear of a letter appearing in *Nature*, from an English or American physicist indignant that Soviet arrivals at international scientific gatherings are not the people whose work is familiar to physicists in the West but instead some grey and totally unknown individuals. This entirely justified letter was widely publicized among Soviet scientists. But why are such letters so rare? Why is the world scientific community so shy of voicing its opinion in the fight for freedom of scientific contact?

The joke about "Russian time" is not such a funny little joke as it may appear in the West. For many of my worthy and talented compatriots, it hides deeply distressing experiences and bitter suffering. I am not a scientist myself, but I passionately sympathize with those of whom I have written and those of whom I have not yet had time to tell in my books. Is there really no one in the West who will join with me? Is there really no one who is offended by the flagrant splitting asunder of science, which should be a single and indivisible whole the world over? Is no one depressed by the fate of those of his colleagues in Russia whose speech, as the poet said, "is inaudible 10 paces away?" Perhaps it would after all be worth while for European and American men of science from time to time to speak out loud and clear on this matter. Voltaire considered the scholar's time the most precious time in the world. Perhaps it is time we understood that "Russian time" is not simply time lost by Russian scholars. It is the loss of all mankind.

Translated by Hilary Sternberg.

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Science Cities: Akademgorodok et al.*

Mark Popovsky

". . . not only was it impossible to meet a person with a human word, but there was even a great scarcity of good beef . . ."
M. E. Saltykov-Shchedrin, *Complete Works in 20 Volumes* (1965–69), Vol. 2, p. 72

THE Vice-President of the Lenin Academy of Agricultural Sciences, Professor Bursky, who at the beginning of the thirties considered the *sovkhoz* an entirely suitable place for training researchers and for the development of science,[1] had hit upon nothing particularly original. His suggestion was only the logical conclusion to a favourite idea of the new regime's—that collective creative work is always preferable to any individual work. Professor Bursky's thesis that " by concentrating the brain power of a special collective on a single question we accelerate scientific thought " simply transferred into the science laboratory experience gained in digging trenches. Nevertheless, far from dying a natural death, the idea developed and spread with time. I have already mentioned the existence of BON, the secret bacteriological laboratory in Suzdal, from 1930–37. During the war a multitude of *sharashkas*—concentration camps for scientists—sprang up. In the *sharashka* under the direction of Academician Tupolev several academicians and corresponding members of the Academy, as well as dozens of Doctors and Candidates of Sciences, designed and built fighter planes. Another scientific prison establishment has gained wide notoriety through Solzhenitsyn's novel *The First Circle.*

The effort to " concentrate brains " and thereby forcibly speed up the development of science is evident in all the activity of Stalin and his successors. Not only did concentration fit in excellently with the principle of " controlled science "; it even complemented and extended it. It was simpler and more convenient to control scientists gathered under a single roof and under common overall supervision.

The first people to experience the advantages of this simplicity were the physicists. After the war, all research work connected with splitting the atom was placed under KGB jurisdiction. Lavrenty Beria became the patron and proprietor of nuclear physics. Bursky's scientific *sovkhozes* were realized in the shape of classified atomic towns. Although unmarked on maps, they existed as real places and to this

* Chapter 8 of the book *Controlled Science* by Mark Popovsky which is to be published by Doubleday. The two *Samizdat* pieces by Mark Popovsky were printed before he emigrated to the West.

[1] See Chapter 1: " The Million "

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day are dotted across our native land from Moscow to the Volga, in the Urals and in Siberia. As for the technological secrets they hide, I would think that Norbert Wiener's words are entirely applicable: "It is far more important to ensure that we possess adequate knowledge than to ensure that any potential enemy lacks this knowledge. The entire organization of military research laboratories is in every respect hostile to our own optimum use and development of information." [2]

What interests us, however, is not these trifling secrets but the way of life, the mental world and ethical climate in which hundreds of Candidates and Doctors of Sciences live in these top-secret settlements. Alas, even this aspect of their existence is shrouded in mystery. Anyone who has ever spent any time behind the barbed wire of these half-camp half-arsenals has the fear of death put into him and prefers to keep complete silence about his past. I have, however, managed to record an account by someone who spent his childhood in one such town. I quote his ingenuous description in full:

> My father is an atomic scientist and spent many years in a secret atomic city in the Central Zone of Russia. My childhood was spent there too. Our miniature city was fenced off on all sides with barbed wire (which I am sure was equally as impressive as the fences put up along the Soviet borders) and was surrounded by very poor villages. The chief memory I have of my childhood there is of the strict, even brutal hierarchy that prevailed.
>
> The director of the "site" and the chief specialists lived in palatial, fortress-like dwellings. Villas in the Stalinist style with verandas and little courtyards were erected for departmental heads. Candidates of Sciences lived in small standard Finnish-style houses, engineers in blocks of flats and technicians in wooden barracks. I was a resident of a villa, and it was only after our maid married a simple mechanic that I discovered what the barracks were like. She and her husband lived in a single room, which was also occupied by another family. A cloth curtain separated them from their neighbours.
>
> However, there were people in our city who lived far worse: the convicts. The production city was surrounded on all sides by clusters of camps. Every morning at daybreak for about one and a half hours I would hear the ceaseless tramp of convicts marching to their workplace under escort. Occasionally, although very rarely, people from this faceless rabble acquired individual human identity in our eyes. Once, a group of prisoners was herded in to build a sewer alongside our house. I still remember those bare shaven heads and grey, exhausted faces. My mother kept a barrel of pickled cucumbers in a passageway. The starving convicts fell on it and emptied it clean. While they worked their guards sat down at each end and in the middle of the narrow lane. One day, returning home from school, I saw the gate to our house wide open; a middle-

[2] Norbert Wiener, *Cybernetics and Society*, Inostrannaya Literatura, Moscow, 1958,p. 12.

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aged, clean-shaven convict, casually waving a cooking-pot, came out and made off towards the end of the lane. One of the soldiers was sitting fast asleep on a pile of logs but another, without uttering a single word, took aim with his rifle and fired. Obviously afraid of being recognized, the convict darted behind a house, and the soldier, as if nothing had happened, settled down again on his pile of wood. Such excess surprised no one in the town during those years (1947–53). After Stalin's death the convicts disappeared from the town and their place in the factories was taken by "black-shoulder-strap" soldiers from construction battalions. But the atmosphere in the town has remained the same. Class distinctions and strict secrecy still divide the inhabitants of such a "military" scientific-industrial centre as much as they ever did under Stalin.

No reliable information ever penetrated our city from the outside world. The scientists, creators of the bomb, remained confident that they were doing good and vital work and that if they had not produced the bomb the American imperialists would long ago have attacked the Soviet Union. The vision of America as an extremely aggressive country where working people lived in utter poverty was even shared by the convicts. I remember there was a small, dilapidated house in our city, with the roof fallen in. An old couple lived in it, both beggars. I once heard a convict say as he passed the hovel: "Look how they live . . . Just like in America . . ."

Children at school reacted to the "multi-storey" social structure of the atom city more directly than did adults. Bitter fights were continually breaking out between us children of scientists and specialists and other children from workers' and technicians' families. These fights had an openly class character and frequently developed into real battles. The poor people's children would fall upon us with shouts of "Kill the beavers!" Beavers—a term in wide use in the town—was what the technicians and workers called the specialists with university degrees. . . .

That was a physicists' city. But the biologists too have secluded corners of their own. Although back in 1925 the Soviet government signed an agreement in Geneva banning bacteriological weapons, a secret bacteriological institute went into operation near Moscow at the end of the twenties, initially under the direction of Professor Velikanov. Later the Institute was transferred to the Kalinin region and accommodated on one of the islands in Lake Seliger. When war broke out Stalin personally had the Bacteriological City moved into the interior of the country, to the provicial town of Kirov (Vyatka). The Leader even indicated which buildings the Institute should occupy —the premises of the Vyatka District Hospital where Soso Dzhugashvili had once been a patient before the Revolution. At that time the hospital blocks were on the edge of the town. Since then, however, Kirov had grown and swallowed up the hospital and now the secret bacteriological city with its store of fearful infections erected its concrete fencing a stone's throw away from the town centre, next door to the Regional Party Committee and Regional Executive Com-

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mittee buildings. Structurally the city, which manufactures offensive and defensive weaponry, resembles a wooden Russian *matryoshka* doll. Outwardly concealed by the provincial town of Kirov, the boundaries of Bacteriological City are guarded by army units, while inside the city and separated by yet another fence are the manufacturing laboratories, protected by KGB troops to make doubly sure.

The *matryoshka* city is enormously attractive to qualified medical researchers, microbiologists and biochemists. The salary of a Candidate of Sciences, a Senior Research Officer, is as high as 600 rubles a month here—higher, that is, than that of a Doctor of Sciences in charge of a department at the neighbouring Kirov Medical Institute. Whereas the shelves in Kirov shops are usually empty, the inhabitants of the secret city are provided with everything they need. Admittedly, life behind its walls is organized according to the strictest discipline and secrecy, but the benefits a research officer enjoys are so great (apartments, a six-hour working day, guaranteed places in an excellent sanatorium every year, the opportunity to present a secret dissertation and defend it with ease, etc.) that the majority of residents in the fortress-city gladly tolerate the atmosphere of constraint.

A Doctor of Sciences who has spent many years in Bacteriological City claims that his tamed colleagues not only know that the weapons they are creating are unlawful; they are also well aware that they are ineffective. What they are manufacturing is in fact spurious weaponry which might perhaps help win a war only somewhere like Mali or Mozambique. Even so, in the full knowledge of this, the 125 research scientists in the city continue with their work, deceiving military and scientific authorities for the sake of personal comforts and privileges.

"Inside the city there is an atmosphere of envy, fear and suspicion," my scientist friend tells me.

> It's traditional. The first director of the Institute, Professor Velikanov, and his wife, were shot; another director, Professor Kopylov, was found dead in his apartment. Apparently he had committed suicide, foreseeing his arrest, but it's possible they just finished him off. Suicide among research workers is quite frequent, but again, because of the total secrecy, their colleagues never learn the causes of all these tragedies. By and large, though, love of life is the predominant spirit in the city. Everyone is afraid of losing the benefits that ensue from secret work and so everyone tries to undermine trust in whomever he regards as a potential rival. The chief method in the struggle of all against all is yet again prompted by the secrecy principle: you have to prove that your opponent is insufficiently vigilant. This charge always produces the maximum effect in the city. The entire population of the place plays at vigilance-spotting. As a result, the strangest situations arise. Colonel S., a Doctor of Sciences, for instance, dropped a permit from his pocket; Colonel P., a Candidate of Sciences, was walking close behind him and picked it up. Instead of returning the document to his colleague he surreptitiously took it and handed it in to the

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> permit desk. In another instance, ill-wishers stole two pages from a dissertation that Research Officer R. had just completed—a secret dissertation. The thieves' reckoning was simple: the candidate would have to answer before a court martial . . .

How do the scientists of Bacteriological City explain their research activities from the moral standpoint? The bacteriologists do not usually discuss such topics amongst themselves. However, in the course of intimate conversations my informer had nevertheless heard his colleagues express several points of view. Most of them would refer to a quotation from Lenin. The Leader, they claimed, used to say that if the enemy possessed a particular type of weapon it would be extremely foolish and short-sighted not to develop the same type of weapon. This quotation is one that Colonel-General E. I. Smirnov (Head of Seventh Directorate, Soviet Army General Staff and Doctor of Medical Sciences) the man in charge of these secret bacteriological cities, loves to make in his speeches. Advocates of this blatantly simple explanation point out that the Americans have their Camp Dietrich where bacteriological weapons are being developed. Why then should we be ashamed?

Other people explain their presence in the city by saying that they are military personnel and work wherever they are told. A soldier is always under orders. As for using or not using bacteriological weaponry already in existence, that is the affair of the authorities. Thus the scientist carries no burden of guilt.

"For a long time I believed my friends at work when they pointed out that they were under coercion," said my acquaintance.

> It's really not at all easy to get out of the army, let alone get out of a secret establishment. But one day life presented us with "the perfect experiment," as they say. In 1965 a big department was closed down. When this happens, workers in the department have the right to apply to leave their jobs and even apply for demobilization. Those are the regulations. However, of the several dozen department members "under coercion," only two left. The rest would never have dreamed of abandoning the gold-mine of the secret city. So, untroubled by any ethical scruples they continue to breed lethal cultures and to rear swarms of billions of insects which are carriers of infectious diseases. And they aren't the only ones. There are quite a few cities like the one in Kirov . . .

But let us leave the atom and hydrogen bombs and the infectious bacteriological localities with their inhuman regulations and lunatic purpose and look instead at science cities of the ordinary type. Such more or less open scientists' settlements began to be created at the end of the fifties and one of the first of them was the now famous Akademgorodok just outside Novosibirsk. The impetus for its construction came from Khrushchev's trips abroad. One of the wonders of the West seen by the first head of the Soviet State ever to venture beyond the borders of his own country were the American universities. The green lawns and elegant buildings of the campuses made an

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indelible impression on Khrushchev's mind. His advisers lost no opportunity to point out to him that the best and most serious scientific work was done precisely on these campuses and that the results were of enormous benefit to the country. A consequence of Khrushchev's travels abroad was his programme of "catching up and overtaking America," one of the priorities being the construction of scientific cities.

The Russians, however, made substantial amendments to the American version. First and foremost the scheme was given a political slant, without which no state undertaking is conceivable in our country. The Siberian and then Far Eastern scientific centres came to be interpreted as outposts of colonial dominion in Siberia. The first "boss" of the Novosibirsk Academic City "Akademgorodok," Academician M. A. Lavrentyev, often used to say in private that in view of the Chinese threat we must prepare our defences in the social as well as the military respect: we must inculcate Russian, or better, Soviet civilization more deeply into the consciousness of the thirty million Siberians. It was for this purpose that the Novosibirsk Centre was created.

Akademgorodok also gave the propaganda machine a real field day. In a land where not so long ago bears roamed and where the government (the Tsarist government, naturally!) used to exile revolutionaries, we, the Soviet people, are building a City of Science. Behold the advantages of Socialism!

The intelligentsia in the capital also had its own ideas about these scientific cities. I remember an acquaintance of mine, a forerunner of the future dissidents, who used to try to persuade me of his fervent conviction that "Whatever their (i.e. the authorities') purposes may be, a thousand scientists, a thousand intellectuals gathered together in a single small town will create a fantastic effect! In such intellectual greenhouses a new philosophy of Russian life may suddenly spring into being!"

At first the intention was to build these towns in the American manner, away from large centres. However, traditional Russian poverty determined the geographical location of the settlements in its own way. Because of the perpetual shortage of foodstuffs the towns began to draw ever closer to the old industrial centres—they might not offer anything special in the line of food but at least there was *something* to eat there. Another problem encountered by the new-style scientific campuses was how to lure the most talented and productive scientists from Moscow, Leningrad and Kiev. The simplest way would have been to have them brought there by force. That was the more usual practice. But the new "liberal" epoch required new solutions. The bait used was the most valuable thing in our life—an apartment. So, they began to build houses and cottages for scientific personnel. Aside from this, scientists who went to Siberia would be promised rapid

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advancement, easy defence of their thesis and promotion to Corresponding Members and Academicians. Most recruits to the cities located not too far from Moscow—Obninsk, Dubna, Chernogolovka, Pushchino, Protvino, Zhukovsky and Zelenograd—were young people and here again they were attracted with promises of apartments and the opportunity to present dissertations in the near future.

What became of these scientists once freed from the bustle of the capital, living a new life in an environment where scientific interests predominated and where they were, materially speaking, relatively well off? People who lived in Akademgorodok in the fifties and early sixties claim that the atmosphere in institutes and laboratories there really did differ favourably from that in the capital. They recall how one would hear scientists in the streets and squares of Akademgorodok and even on ski-ing expeditions enthusiastically discussing the problems of their particular scientific discipline or talking about art. They also say that during the first 10 years (which coincided with the post-Stalin thaw) relations between senior and junior staff members at Akademgorodok were notable for their comparatively democratic character.

Both Doctors and undergraduates alike had to labour with their own hands in order to complete the building of their laboratories in the quickest possible time. Working as a team brought scientists of different generations together. I have also heard that there was a certain enlivenment of cultural life during those years. Poetry, music and film clubs sprang up. The "Under the Integral" café was the place where scientists met the country's most celebrated writers, poets and bards who sang their own songs to the accompaniment of a guitar. A bookshop with the romantic, literary name of "Grenada" also became widely known as a place to meet writers. Finally, as we know, those were the years when a number of interesting scientific ideas and discoveries emanated from research workers at the new institutes. The physicists and mathematicians were particularly creative, but geologists and specialists in hydrodynamics also made outstanding contributions to science.

A great deal was said and written about the city at that time. The so-called creative intelligentsia of Moscow eagerly travelled to Novosibirsk to attend all kinds of meetings. A colleague of mine, the writer and physician Yuly Krelin, spent some time in Novosibirsk in 1968 and wrote an essay which conveyed rather well our attitude of reverence for the City of Science:

> . . . You drive around the city and you marvel and rejoice at how beautiful it all is—the buildings in the taiga are beautiful, the hotel complex with its post office, shops and cinema is beautiful. This is the city centre. You drive out to the edge of the city and there you see wonderful, beautiful cottages. Here is where the particularly eminent Doctors of Sciences, Corresponding Members and Academicians live. And then there are the city's real centres—

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> the institutes. And again they are beautiful. I don't understand exactly what it is that is beautiful about them. They are the same as any other buildings anywhere else in the country; the houses where the people live and work, the buildings where they shop are all the same as anywhere else in the country, but still they are beautiful. Perhaps it is because of the forests. Or perhaps the awareness that all these buildings, these ordinary, everyday buildings, are blessed with a spirit. The spirit of truth, the spirit of the future, the spirit of science, the spirit of intellect. . . . You walk round the city, you mingle with the crowds in the shops. Although the word crowd is quite inappropriate . . . I have never seen such an endless, almost unbroken stream of intelligent faces. Gradually it began to seem to me that all the women I passed were beautiful and all the men wise, handsomely-proportioned and athletic.[3]

When Yuly Krelin saw Akademgorodok the city was already passing its peak. At the end of the sixties everything started to change. The buildings, the forest and the squirrels in the streets remained, but something had snapped, and the campus which had only recently still been imbued with such spirit began rapidly to take on a new face.

The first thing that distinguished scientific cities right from the start was, as I have already said, a shortage of foodstuffs. However, this shortage immediately highlighted the "class" character of the population. Junior staff were allocated certain retail distribution coupons, Doctors of Sciences different ones. Corresponding Members and Academicians received "Kremlin" rations. Meat was in especially short supply. A junior research officer in Akademgorodok bringing home the very modest bit of beef to which his coupon entitled him would see a covered van drive up to a cottage and a dozen young men lift out and carry into the house heavy hampers covered with napkins to conceal the selection of meat and other provisions inside. Novosibirsk "juniors" have also told me of the existence of a special "House of Scientists" with an elegant restaurant exclusively for Academicians. I have also heard from them how, at a special board meeting in the "ordinary" House of Scientists, Doctors of Sciences held a serious discussion as to whether any Candidate of Sciences could be a full member of the "House."

The hierarchical system which developed and was strictly maintained, and under which a scientist's degree and professional office determined his life-style led to a sharp diminution in people's trust in one another. Research workers who tended as it was to mix only with colleagues within their own scientific discipline now began associating only with people belonging to their own social stratum. "With us everything is clear-cut," sociologist A. A. explained to me on the first day of my visit to Akademgorodok. "Candidates separately, Doctors separately. As for the Academicians, we don't even talk about them. They are as invisible

[3] Yuly Krelin, Unpublished essay commissioned by the journal *Znanie-Sila*.

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and inaccessible as the gods." Young people lost the chance to discuss scientific problems with their seniors on an equal footing—to say nothing of social problems. As a result, there was an upsurge of unconcealed careerism, with junior researchers endeavouring to scramble at top speed on to a higher rung of the social ladder.

Immorality in social relations quickly spread to scientific relations. Academician physicist Lev Andreevich Artsimovich (1909–73) described precisely the atmosphere that this created.

> A calm and peaceful life in conditions of the narrowest possible specialization and an utter lack of interest in what one's neighbour is doing—this, unfortunately, is the picture that is fairly widespread in some of our institutes. Under such circumstances making an important discovery is as difficult as, say, buying Aladdin's lamp or a magic wand in a Mostorg shop.[4] Indeed: from then on productivity began to decline in the institutes of Akademgorodok and is declining to this day.

However, the curve charting the growth in scientific "cadres" rises higher every year.

Towards the end of the first decade there was a sharp deterioration in the quality of the research personnel at Akademgorodok. Researchers who had obtained their qualifications and made a name for themselves begin pouring out of the city to Moscow and other large centres. A cause of this ebb-tide was the altered social atmosphere: but one of the main negative factors was the city's poor consumer supply—the scarcity of that same accursed beef. Half-joking, half-serious, a former resident of Novosibirsk once said to me: "I wear myself out at work and when I come home for a meal my wife says there's no meat—'have some "tyurya" [a pulp of bread and milk or water], Yasha. . .' And so it goes on for a year, or two years, or seven years. Well, there are limits to one's endurance. . ."

There was another aspect to the worsening quality of research workers. When Akademgorodok sprang up alongside Novosibirsk, many of the latter town's residents—engineers, chemists, medical workers and teachers who had previously worked in plants and factories, hospitals and schools—drifted into the research institutes in the hope that they would eventually be able to present a dissertation and improve their material situation. Hundreds of people with the most varied abilities and natural gifts were swept along with the tide. Sociologists in Novosibirsk managed to study the process and even published a few statistics during a period when there was a slight political thaw. By questioning several hundred research officers who had come into science from industry the sociologists came to the conclusion, among other things, that 67·9 per cent had been attracted to the institutes by an inclination for original scientific work. The remaining 32·1 per cent—

[4] From an article published in *Literaturnaya gazeta*, 19 Feb. 1969.

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one in three!—had moved into science quite casually, tempted purely by the material opportunities.[5]

The crucial year for Akademgorodok was 1967, when 46 research officers from various institutes signed a letter of protest to the CPSU Central Committee against the arrest and imprisonment of the poet Yury Galanskov.[6] Most of the signatories were young people. Almost half were Jewish. In response to the protest the authorities staged mass repressions among the young scientists and incited acts of anti-semitism. Public repentance was demanded of the offenders. For those who refused to repent, conditions were made so unpleasant that they were forced to leave their jobs (biologist R. Berg, mathematician A. Fet, writer I. Goldberg, biophysicist Zaslavsky and others). They were not allowed to present the dissertations they had already completed. "Under the Integral" and the poetry and music clubs were declared hotbeds of political unreliability and closed down. Meetings with writers and singers and exhibitions of unofficial art were stopped.

The administration made special efforts to arouse the anger of older scientists against those of the younger generation. Academicians S. L. Sobolev and A. D. Alexandrov, both mathematicians, sent a letter requesting the CPSU Central Committee to intensify repressions against dissident youths. Geologist A. A. Trofimuk, also an academician, proclaimed: "Our city is a beacon which a few snivelling creatures have been trying to extinguish." Two years later, in March 1970, I heard Academician G. I. Budker, Director of the Institute of Nuclear Physics, say: "We built Akademgorodok in order to devote our attention to science here; these *kids* are getting in our way and holding up the development of science, such people should be turfed out with the garbage."

I had come to Akademgorodok to deliver some lectures at the invitation of the House of Scientists. It was March 1969. My first lecture dealt with the fate of Academician Vavilov who had died in prison. At that time there was intense interest in recently discovered material on the life and death of the great biologist. Audiences of two or three hundred had come to hear my lectures on Vavilov in institutes in Moscow, Leningrad and Saratov. To my amazement, no more than 50 turned up at the House of Scientists. Furthermore, the chairman, Corresponding Member of the Academy D. K. Belyayev, refused to allow questions from the floor and announced that the meeting was over immediately I had finished speaking. When I asked why the audience was so small, Belyayev replied: "We aren't interested in having

[5] Anthology *Organizatsiya i effektivnost nauchnykh issledovanii* [The Organization and Effectiveness of Scientific Research], 2nd edition, Novosibirsk, 1967, p. 125. Article by I. V. Chernov and A. I. Shcherbakov, "Sociological Questions of the Organization of Labour."

[6] Yury Galanskov died aged 33 in the autumn of 1972 in the Potma camps.

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our young people listen to *this sort of talk*." In other words, young scientists had simply not been let in to meet the author.

Next day I was given another taste of the war between the two generations. My second talk was called "Why the Scientist needs a Conscience." Again, the controllers of Akademgorodok made an effort to protect the young scientists from this "too sensitive" issue, using the well-tried method of confining the meeting to a very small room. Only Doctors of Sciences, Corresponding Members and Academicians received invitations. The younger scientists, however, heard of the plan and foiled it by filling the room well ahead of time, so that when the senior scientists arrived they had to put up a fight for their "rightful" places. Once again after the meeting the chairman of the House of Scientists, Professor Gaisky, argued that young persons should be strictly protected from hearing speeches by writers mentioning the tragic fate of certain scientists and the immoral behaviour of others. "The young people may misunderstand you and draw false conclusions," I was told by Professor Gaisky, whose father, an eminent biologist, only survived his time in a scientific "sharashka" in the thirties by pure chance.[7]

Akademgorodok went through a long period of antipathy for youth and appears still not to have shaken off this senile affliction. Here is a typical conversation that took place between a Doctor in Novosibirsk and a visiting writer:

"Somehow I don't see any outstanding individuals, any talent among our young people. . . ."

"But what contact do you have with them?"

"I give them lectures."

"Then you have no direct contact with them."

"I don't have time to associate more personally with them. I can't run studies or seminars, I'm too busy."

"Couldn't you take just one group? Listen to their voices, find out what ideas they have, and perhaps after that the young people won't seem quite as untalented."

"Why are you so much in favour of young people? You forget: everything bad has always been the work of young people."

"In the first place, everything good too, and in the second place, just about every innovation. But if you still maintain that they are responsible for 'everything bad,' that is all the more reason for spending more time in their company and inculcating in them standards of quality and integrity. The 'bad' they do always comes of their being inculcated with the idea of the primacy of *gain* over *quality* and *integrity*. . . ."

"That's something that needs working on every hour, every second

[7] See Chapter 1, "A Hundred Times More . . . ," the story of the arrest of microbiologists working on tularaemia (Gaisky, Elbert and others).

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of the day—and where would I find the time for that? No, it's impossible!"

"But perhaps that is precisely where your priority should lie?"

However, the concept of conflict between "young" and "old" in Novosibirsk's Akademgorodok would not be an entirely accurate definition of the disposition of forces. Sometimes it was not only among the young that radicals were to be found. Towards the end of the sixties and in the early seventies signs of social disquiet were also occasionally shown by scientists of the older generation. Meanwhile, too, young biologists would argue with young physicists along the following lines, for example:

". . . Well, all right, you physicists have given a great deal to the world, but you must have a tremendous lot on your conscience—after all, it was you who invented all the weapons of destruction. . ."

"We are scientists first of all and we cannot repudiate a truth once it has been revealed to us. The bomb is simply a by-product of a truth. Truth always has to be paid for. . ."

"I understand: you can't cover up what has already been uncovered. But doesn't your conscience torment you? It is conscience, people's sense of conscience and morality that saves the world."

"Are you really claiming that? Why, if it hadn't been for the bomb, governments would have been forced—in our time—to arm millions of people. The world would have turned into military camps. It may well be that we have saved the world. Though not without cost, of course. . . . But look at the sort of thing you geneticists would get up to if you were given the chance. . ."

Another dialogue that provides a vivid example of the atmosphere at Akademgorodok at the beginning of the seventies:

"Look at the scarf that waitress is wearing!"

"How on earth did she get it?"

"That's just the point! They were only on sale in the closed order shop for Academicians and Corresponding Members."

"Ah, to hell with her. . ."

"Yes, to hell with her! But do you know what a scandal there was! The Academicians' wives kicked up such a fuss—it was bad form, out of order, those scarves were for the higher echelons. . ."

At the beginning of 1976 I had another opportunity to hear about life in Akademgorodok. Doctor of Biological Sciences Sh——, an old friend of mine, came to Moscow from Novosibirsk, and, shortly after, I met two more scientists in Moscow who had only recently left the Siberian City of Science. How did they find the place, now on the threshold of its twentieth anniversary?

The biologist:

> I spent eight years in Akademgorodok and I have lots of friends and acquaintances there, but now I've left. For me, as for many other people, Akademgorodok has lost its attraction. The spirit of

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> science has flown away from the city and it has become a place where people simply "turn out dissertations." Whether they're good, bad or utterly useless, the Academic Councils just wave them through—they can't knock their own people. What is it that has brought about the city's ruin? The atmosphere of a communal kitchen. Everyone knows everyone else, everyone is forced to put up with the sight of everyone morning, noon and night, everyone is dependent upon everyone and all are afraid of one another. Monotony of visual and mental impressions has ended by producing indifference to science as well. Nowadays you no longer come across people in the street, the shops or the House of Scientists forgetting all else and discussing scientific problems with one another. All they do now when their working day is finished is scamper off home to their little burrows—their apartments.

What do Candidates or Doctors of Sciences do in the evenings? Sh—— described a friend of his who, in his opinion, represents a typical inhabitant of Akademgorodok. This 40-year-old Doctor of Sciences, a physicist and laboratory head, spends hours lying on the sofa watching television or indulging in solitary, aimless skiing. Ever since the clubs and cafés were closed down the social life of the scientific population has sharply altered. Vodka and cognac have become the prime movers of spiritual progress. At every gathering they are the inevitable accompaniment. In their homes people no longer hold conversations or exchange opinions and views. They appear to have lost the capacity for listening and for coherent speech. The solitary drinker has arrived and taken over. Local sociologists estimate that no less than 35 per cent of men and women in Akademgorodok drink habitually, many of them daily. Another friend of Sh——, a Doctor of Geological Sciences, believes that in Akademgorodok there can be no real friendship or real love. He points to the innumerable adulteries resulting from boredom which have become a way of life in the scientists' village. Men and women alike boast of their bedroom escapades.

In Sh——'s opinion, the most outstanding creative individuals in Akademgorodok have all left the city, while the people who have now come to power in the institutes and are responsible for overall academic direction are smart operators, ruthless and crafty politicians for whom science is simply a means of doing well for themselves.

To biologist Sh——'s sketches of everday life K——, a sociologist, adds his own reflections also culled from many years' observation of life in Novosibirsk's academic city.

> In Akademgorodok the game of high science competes with morality. In the eyes of most researchers the pursuit of science is in itself sufficient justification for any personal amorality. How has this ethical prescription arisen? For years propaganda drummed into us that Soviet science would eventually solve all the problems of existence. Again and again we were told that the scientist working on some grand-scale project is a hero. To this day the

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cinema and novels increasingly abound in the sort of character who goes without sleep and refuses to take a holiday until he has completed a certain project on time or finished some vitally important government-commissioned task. Of course there really are some people in our country who toil away like that. But even the most single-minded of them cannot fail to see that the moment science lays a golden egg the carrion-crow of the state swoops down and steals it. Scientists are well aware that their most grandiose schemes are used for the pettiest of political aims. But if they tried taking their thought to its logical conclusion they would either have to give up science or become political fighters, and the overwhelming majority of them are incapable of either. There remains a third, saving alternative that suits everyone: science itself is proclaimed ethical and the behaviour of any person engaged in the study of science is thus highly moral. The scientist creates a useful product and the creator of a useful product is indubitably a moral person. Many scientists today—be it voluntarily or forcibly—allow themselves to reach this convenient conclusion. In the contest with morality, science is the winner.[8] Akademgorodok is a place where this attitude has come to prevail altogether. Unfortunately it has happened too late, when there is no serious science left there.

The third person I talked with was a former university lecturer from Novosibirsk. What worries him is the fate of the youngest generation in Novosibirsk, the students and school-children, because it is they who in a few years' time will replace the present junior and senior research officers in the laboratories.

In the heyday of Akademgorodok a school for highly gifted children was established. The idea of this favourite brainchild of Academician M. A. Lavrentiev was to turn out geniuses. And why not, after all? By means of a system of competitions held all over Siberia, 600-800 mathematically gifted girls and boys were selected each year and brought to the city where they were placed in a private, barrack-like boarding school. The infant prodigies received instruction from Academicians and Corresponding Members of the Academy. In physics and mathematics they were taught the kind of things that even university students sometimes have difficulty in understanding. Admittedly the children's arts syllabus had to be cut by half. But then, what need had mathematicians of history and literature? Since science was in itself a moral subject and the study of science in the Soviet Union has always been a highly moral pursuit, it was Academician Lavrentiev's view that the children needed no extra or additional moral assets. True, the students were assigned educational tutors, but these highly gifted children did not give a brass farthing for their educators. In the final analysis, what educated them was something entirely different.

[8] A zealous proponent of this thesis is mathematician A. D. Alexandrov, an Academician from Novosibirsk-Akademgorodok. A detailed exposition of his theory of a shifting morality dependent on quantity of information appears in the anthology *Nauka i nravstvennost* [*Science and morality*], Moscow, 1971, pp. 26—73.

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A pupil had only to get three out of five for him to be automatically expelled from the physico-mathematical school under its statutes. Fear and shame at the prospect of crashing down to earth from these heights and having to return to the *ordinary* world hung as a constant threat over the heads of the children. Any atmosphere of friendship and mutual help soon disappeared from within the walls of the privileged school. Fifteen-year-old careerists began to thrive while others simply dropped out.

However, the chief ordeal came for these children after they had taken their final examinations and graduated from the school to university. In their first year as students they often had nothing to do since they already knew more than the rest. The gifted ones idled away their time and behaved rudely towards the lecturers. They had no respect or liking for their fellow students whom they regarded as too ordinary, while the latter kept their distance from the master-minds. Various fates lay in store for these educationally unbalanced, ill brought-up and spiritually empty youths, but to say that they enriched science or the social climate in Novosibirsk would be a great exaggeration.

As the years passed, other pernicious aspects of privileged education revealed themselves. The Academicians lost interest in the school and teachers were taken on who were hardly more enlightened than teachers in normal schools. The standard of attainment dropped, but the pretensions of the graduating pupils remained the same as ever. At the same time, by picking several hundred of the most gifted physicists and mathematicians out of the common stock every year, Akademgorodok was impoverishing the talent in ordinary schools and producing dullness and mediocrity over Siberia as a whole. The experiment launched many years ago has now become essentially obsolete. The fact is generally acknowledged; however, no one has the courage to close the " school for geniuses "—the directive has to come from on high.

I have dwelt in some detail on life in the Novosibirsk Academic City because the diseases with which it is afflicted are typical of all other cities of this kind. The cause of these " diseases " lies not only in the long-standing ill health of Soviet science as a whole but also in the fact that these cities, just like cantonments or settlements for seasonal workers, are *rootless formations*. The majority of citizens lack a circle of relatives, old school friends, teachers, or even neighbours of long-standing acquaintance. There is nothing to restrain the inhabitant of a rootless city from antisocial extremes except perhaps fear of losing his job or innate caution. The inner jolt to one's conscience that comes of censure by one's nearest and dearest is virtually an unreality here.

Rootless cities have a particular atmosphere of their own, on the one hand rather dismal, but on the other hand permeated with electric

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restlessness. I have been to Protvino, Pushchino, Dubna, Ramon, Obninsk and Chernogolovka. They differ in their relief, their architecture and the nature of the scientific problems they are investigating, but it seems to me that all these localities have a certain something in common. In all of them a person feels like a temporay resident. The instability and impermanence of their fate eventually lead to an inner imbalance. This instability is evident even in the behaviour of the most brilliant and apparently quite successful researchers. However, why not let them tell it in their own words. . .

Chernogolovka is a settlement with three academic institutes. Situated 50 kilometres from Moscow, it was founded in 1958. The nearest underground station, the terminus of the line into Moscow, is an hour and a half's ride away by bus. The population numbers approximately 10,000 with a projected 30,000. There are large numbers of small children, and about 1,000 research officers. Apart from living quarters and institute buildings Chernogolovka possesses one shop, a post office, a hospital, a school and a House of Scientists. The fringes of the town merge into forest. There is no form of local self-government at all. All the functions of authority have been assumed by the founder and virtual manager of the town, deputy Institute Director and Academic Administrator F. I. Dubovitsky, known locally as "Tsar Fyodor Ioannovich."

Doctor Dubovitsky, an explosives expert, is a man of stern temper and firm principles. He regards service to science in much the same way that sixteenth century Russian noblemen viewed service in the "*streltsy*" corps: the *strelets* need only know his own arquebus and powder-flask—the rest was foolish nonsense. True to his principles, in the 18 years of his rule "Tsar Fyodor Ioannovich" has built no swimming pool, tennis courts or restaurant in Chernogolovka. He regards all that sort of thing as over-indulgence.

Only once have I ever seen this autocratic ruler, and briefly at that. My scientist companions were showing me the sights of the town. We were in a shop, when a robust elderly man getting on for 70 and looking rather like a retired veteran colonel came in. His expression and gait betrayed him as the boss. A respectful murmur ran through the queues of men and women at the counters. At the same instant all trading operations were suspended. Even the cashier stopped taking money. A white-coated manager sprang out of the interior of the store and, all but taking him by the arm, conducted the highly-honoured guest into the recesses of his sanctuary. One by one the counter assistants too were summoned thither and disappeared. The queues of people stood in silence. Not a single person complained.

I caught another glimpse of the "tsar's" personality in a casual conversation in a laboratory. The talk turned to the subject of the Kh——, a Doctor of Sciences whom I did not know, and I heard someone utter:

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"Dubovitsky likes Kh——, and he likes him because Kh—— is afraid of him. . ."

Such was Chernogolovka in 1975. What do the scientists who live there think of themselves and their town?

Alexander Evgenievich Shilov, aged 45, a Professor and Doctor of Sciences. The second most important person in Chernogolovka. He lives in a two-storey cottage with his wife and son and a dog. He is the fortunate possessor of a car and a direct telephone link with Moscow and receives special supplies from the capital.

> The original idea of building a place where scientists would be able to live amid nature, freed from city noise and cares, was clearly sensible—and fruitful. For a long time Academician N. N. Semyonov was unable to find a suitable person to deputize for him in Chernogolovka. In 1962 I had just returned from an official scientific trip to England. I liked the idea of living in a cottage, as in Oxford, so I agreed to come here . . .
>
> I know very little about the locals in Chernogolovka and their life. My wife and I try not to mix with them at all. But there have been one or two noticeable changes over the last few years. Our town looks bleak and inhospitable. Architecturally it's total failure. Whoever planned and built it didn't provide any amenities for the present inhabitants and had no thought at all for future generations of residents. The children of research officers who came here in the early sixties are growing up. Where is there for them to go after school? The only places to work in here are the research institutes. Regardless of their children's tastes and inclinations, parents are sending them to chemistry and physics faculties, simply and solely to have them trained, bring them back to Chernogolovka and squeeze them by fair means or foul into the Institute of Physical Chemistry. *Because there's an apartment here*! And so the composition of the Institute's staff is gradually changing. The people who first came here were attracted by science; nowadays there are a great many who choose to work here simply for an apartment. The problem is fatal both for the Institute and for science as a whole, and so far we haven't found a way around it.

Alla Konstantinova Shilova, age 40, Candidate of Sciences and wife of A. E. Shilov.

> The environment in the town has definitely deteriorated since they built an instrument-making factory here and 3,000 workers came flooding in. It used to be such a clean place: no-one would dare throw cigarette-ends on the pavements. Now it's filthy. The factory is attracting more and more boys from Noginsk. They jump the queue for flats. Long-haired characters with transistor radios—and most of them are hooligans.

G.L., age 41, a Doctor of Sciences, Author of internationally known research papers. Married with one child. Lives in a multi-storey brick building.

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My wife and I lead a very unsociable life. I don't particularly want to invite my colleagues to my home. Conversation in the town is never anything but private gossip or women prattling about clothes and men about laboratory problems. In our little world it's unsafe to confide in anyone. Outside laboratory confines there is nothing but boredom. People in Chernoglovka are continually leaving their families and children in search of new impressions or simply for the sake of variety. And their new marriages are just as senseless as the previous ones.

R.G., a Candidate of Sciences, about 40 years old. Married with two children. In his supervisors' opinion a hard-working and enthusiastic researcher.

I enjoy it here. I love nature. In the mornings I go jogging in the nearby woods; in winter I go skiing. I have no time to grow bored: I come to the lab at nine o'clock in the morning and I don't leave until nine at night. There's a lot of work and I like it. But there are many people who really are depressed by life in Chernogolovka. The thought that it is so hard, almost impossible to get away, is very dispiriting. The Institute considers your apartment its property. You can only exchange it for an apartment in another city through the law-courts, and if you do that it's a scandal, a black mark against your professional record. It's a terrifying decision to take. Also, the directors will only take young people in your place. In Chernogolovka old men are regarded as ballast.

Laboratory assistants and junior research officers undertake candidates' dissertations purely out of want. If you remain a lab assistant for 20 years you go on getting your 100 rubles a month for 20 years. Because of this, people push and shove their way into science whether they have any aptitude or not—some of them are the sort of people from whom science ought to be well and truly protected.

Ten years ago, according to R. G., research staff still used to visit each other's homes, but now personal relationships have disintegrated: people do not want to repeat at the tea-table the sort of conversation they hear anyway everyday in the laboratory. On the other hand, R. G. would very much like to discuss scientific problems with such experts in his field as Charles McKenna from the University of Florida. He would be interested to talk about his experiments with Leonard Martinson from the University of Texas or with the people from the nitrogen fixing laboratory at Ohio State University. He would be especially keen to correspond with Charles McKenna, a great person with a good brain. What's Charlie up to? What ideas is he working on? But Candidate of Sciences R. G. is only entitled to send letters to the United States through the Academy of Sciences' Foreign Department; his letters spend months in the pipeline and the replies come half a year later, by which time he has lost interest in them and the problem is out of date. And if you touch on anything too personal in your

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letter, it vanishes into total oblivion. McKenna, like any other foreigner, cannot come to Chernogolovka, and for Candidate of Sciences R.G. a scientific trip to the USA is virtually an impossibility. Each year he applies to the Academy to make such a trip, but. . .

A.K., age 28. Recently presented his Candidate's thesis. Also recently married. Salary: 175 rubles a month. Lives with his wife in a hostel but hopes to obtain an apartment. After all, all his credentials are good. . .

> My wife is a medical doctor and she's very miserable here in Chernogolovka. And I know of other people too who dream of getting out of here—they say they're dying of boredom and loneliness. As for me, though, I have no intention of leaving. In the first place, the work is interesting, and in the second place I'm used to this life. My father is an army officer. We've spent our whole life wandering from one cantonment to another. In those places too no one had any friends or relatives, so the conditions here don't have any effect on me. I'm hardened to them. I make friends with the people I work with. We get together at home and our conversation there is the same as in our laboratories. What else is there to talk about? We have no time to read literature. There's only time to skim through *Literaturnaya gazeta* . . . Of course, sometimes I'd like to go out somewhere just for a break, but there's nowhere to go apart from the House of Scientists. Only Candidates and Doctors may be members of the House of Scientists; each has his own seat reserved for him in the auditorium. But I only got my degree recently and nothing has been fixed for me yet. I have to rely on the odd ticket left over at the box-office after the real scientists have had their pick . . .

Candidate of Sciences E.F. is 32 and is spoken of in Chernoglovka as a brilliant man with extremely interesting ideas.

> It's like living in a glasshouse. Whenever I want to be alone for a little while, to go off and think—mostly about scientific matters —there's no place I can go to. Our flat is tiny, I have a wife and child at home with me. If I go out for a walk everyone I come across is someone I know and they immediately drag me off for a drink or involve me in some idle chit-chat. There is only one thing left to do: flit off to Moscow, lose oneself in the crowds, the noise of the city. Being in a crowd is the best form of solitude. It revives you enough to last you another week. My wife finds life in Chernogolovka even harder to bear. But where would we go? Here we've got an apartment . . .
>
> Public opinion here in Chernogolovka is more severe than in the big cities. People only indulge in debauchery and hard drinking in secret. It's considered entirely proper, for example, to stay up in your laboratory until midnight, but improper to go for a walk with your child or simply to take time off for a stroll in the forest. If they were ever to open a restaurant in our town it would soon go out of business—research officers would be afraid to be

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seen in it for fear of annoying "public opinion"—by which they really mean their superiors.

Finally, the opinion of an ordinary physician without a university degree, V.L. She has problems of her own, no less serious than those of the academic community. She is worried, for example, about her schoolboy son. He has already several times been beaten up at school and had boys shouting "Yid" at him.

The school at Chernogolovka is also special in its own way. It is used as a centre by the Academy of Pedagogical Sciences. Educational experts from Moscow come here and new teaching methods are tested. The architects who designed the school even received an All-Union Prize. All this notwithstanding, the Chernogolovka school is, structurally speaking, rather like an egg in which two strains have coexisted for years without intermingling or merging: the scientists' children and the children of peasants from nearby collective farms. These children seethe with a permanent mutual hostility. The offspring of the intellectuals, who are more cultured and more widely-read, assert themselves in class, while the heirs of the peasant farmers get their own back during breaks and after school. Fights, punch-ups, all sorts of name-calling and insults are the main substance of school life, and there is nothing any Academy of Pedagodical Sciences can do about it.

Another problem that weighs heavily on Doctor L. is what to cook for dinner each day. The local shop is wretchedly supplied from resources in the immediate area. The 40 top scientists obtain their groceries "by order" from Moscow. Doctor L., however, has neither a car nor the right to a special ration. All that is left for her to do is help her husband, a Doctor of Sciences, on with his rucksack and dispatch him to Moscow by bus to forage for provisions. Nature? Yes, Physician L. loves nature, but life being what it is here, under the conditions dictated by existence in Chernogolovka, she somehow hasn't enough energy left for nature. . .

Such is present-day Chernogolovka. As we can see, there is not a great deal of difference between the way of life and inner spirit of Akademgorodok and of this one in the vicinity of Moscow. Chernogolovka is an Akademgorodok that has never experienced a "golden age." There has been no brief period of social and scientific animation of the kind that has left people in Novosibirsk with pleasant memories and illusory hopes. In Obninsk, in Pushchino and in Ramon there are no hopes. Attitudes and relationships within these places have been laid bare. Restriction and inequality are open and unconcealed. A scientist's social weight is more often than not determined not by his talent or creative potential but by his salary, by the quality of his apartment, by whether or not he has the right to a seat in the House of Scientists and even simply by the size of the meat ration to which he is entitled.

The ethical picture in Siberia and the Moscow region is also rather

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monotonous. I have been able to see a great deal for myself ever since, 10 years ago, I embarked on a series of public lectures, travelling out to various scientific cities to give them. Actually my first lectures had been not in those cities but in the scientific research institutes and Universities of Leningrad, Saratov, Vladivostok and Tartu. However, before long, denunciations started coming in to the Writers' Union and the USSR Procurator General's Office. I was accused of political disloyalty, obliged to give an account of myself to General Ilyin, the official responsible for supervising Moscow writers, and to General Terekhov from the Procuracy, and was banned from lecturing (in the Central House of Writers and the Academy of Agricultural Sciences). However, interest in the fate of Nikolai Vavilov was steadily growing. At this juncture the Houses of Scientists in Novosibirsk, Dubna and other science cities involved themselves and started to invite me directly, bypassing the Writers' Union. This was the beginning of my friendship with a wide circle of people living in scientific communities.

To tell the truth, I did not at first understand why my kind hosts could still afford to do what ordinary libraries and research institutes in the capital no longer felt able to allow themselves. However, my first visit to Dubna resolved all my doubts. When I warned the Director of the Dubna House of Scientists, Oleg Grachev, a former (?) KGB major, that my account of the life of Academician Vavilov contained a number of pointed remarks, he simply smiled indulgently and replied: "In our presence you can talk about whatever you like. Camps? Prisons? How Lysenko stifled Vavilov? Go right ahead, with pleasure. It's not dangerous for us. We're all *on high salaries* here."

Far from everyone in Dubna receives a high salary, but the very existence of high salaries just a stone's throw away and the possibility of eventually receiving one yourself are distinct restraining influences on political passions, as far as I could judge. Nevertheless, to the outsider, his first venture into a scientific city always seems a festive occasion. A room is reserved for you in a first-class hotel; you are shown the synchro-cyclotron and they explain to you all about rays and megavolts. You take a walk along the low bank of the Volga and eat in a rather good local restaurant. In the evening you give your talk and then enjoy a late supper in the company of your new friends. Seen thus, the town may indeed appear a haven for wise men and intellectuals. The same impression is made by Protvino and Pushchino too—*on the first day*. In Protvino you are struck by the grandeur of the House of Scientists and the interesting architecture of the shopping streets. The young physicist appointed as your guide tells you with great emotion and enthusiasm about the houses with two-storey apartments which are under construction here for Doctors of Sciences and heads of laboratories. "Very stylish! No worse than in England, in fact!"

Pushchino, the biologists' city which stands on a hill, creates the

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opposite impression—of being unfinished and rather empty. However, the beauty of its natural setting delights the eye. From its height overlooking the River Oka there is a wonderful view of birch-clad plains receding into the far distance, and the river itself skirting the town like a sickle. The air is amazingly pure. When you have breathed it to your heart's content you can visit a restaurant with a Graeco-Roman name ("Neptune" or "Poseidon") where guests are regaled with fish delicacies entirely in keeping with the restaurant's appellation. The remainder of your programme follows the same course as ever: a lecture, intellectual discussions, a magnificent hotel. . . .

Whoever leaves this abode of the gods next morning with no intention of ever returning will take with him only memories of the delicious taste of the food to which he was treated and the panorama of the distant countryside beyond the Oka. If, however, you visit Pushchino a second or third time and make friends there, an altogether different side of this city with its five Academy of Sciences Institutes is revealed to you. Take, for instance, the lights in the windows late at night which you were shown on your first visit when you were proudly informed that "The scientist's enthusiasm for his work glows day and night." When you have lived in Pushchino for a few days you discover the real truth—that the midnight oil is burned only in the apartments of laboratory assistants and junior research students. Candidates of Sciences are in bed by 11 at night, while Doctors of Sciences retire even earlier. People without degrees have no time to sleep. They have to hammer out their theses and hunger is the spur.

Or take another Pushchino myth which visitors are made to swallow on their first day: "Many researchers here spend their Saturdays and Sundays too in the laboratory." On the third day of your stay in Pushchino you hear another, more credible, comment on this subject. A woman mathematician who has lived in Pushchino for several years explains:

> Yes, many researchers really do go off to their laboratories on Sundays. But why? In our little community, reserves of family warmth dry up more quickly than in a large city. Being at home is boring for a young Candidate or Doctor. And ours is a hard way of life. So the men think up a way of justifying themselves: I can't be of any help to my wife because I devote all my energies to science. It's easier for them in the laboratory; they can spend the whole day chatting with their friends, even if they don't do any work. The laboratory on Sundays is a sort of spiritual tavern, if you like.

Private conversations with scientists who live in Pushchino lift the veil off the most intimate sides of both the personal and public life of the community. R——, a young Candidate of Physico-mathematical Sciences, regards Pushchino as the freest and most convenient town to live in of all the towns in the Moscow region. Public transport

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connexions to Moscow are better and the scientific authorities include some quite decent people. One of them is Academician Alexander Sergeyevich Spirin, Director of the Protein Institute, who so far has not signed a single letter against Academician Sakharov. Dishonest staff do not usually remain in his institute for long. At the same time, however, in the opinion of physicist R——, there are hardly any intelligent people in the Protein Institute. "The Institute has an excellent library," he says, "but the physicists, biochemists and biologists whom I know only want to read detective stories and science fiction. I go into the library and all I hear is 'Haven't you anything lighter?'" There is practically no demand for serious books; and the overwhelming majority of scientists feel absolutely no need to read good literature.

A third-year biochemistry research student told me about another aspect of life in Pushchino. A certain Elkin, a research student of Academician Gleb Mikhailovich Frank (of the Academy of Sciences Institute of Biophysics) cribbed his thesis from an article in a foreign journal and, to prevent exposure, removed the journal from the library and destroyed it. The forgery was only discovered two years after he had successfully defended his dissertation. Angry and indignant at this episode, young Pushchino scientists have been demanding a public enquiry into the affair. But Academician Frank does not wish for any exposures and nor do the other professors. When the matter was put before the Academic Council of the Institute of Biophysics the necessary two-thirds majority vote to strip the thief of his degree could not be obtained—the Doctors of Sciences were afraid to cross the Institute Director. Young scientists are still insisting on an honourable decision but their voices go unheard in Pushchino. "We intend to continue fighting the people who are shielding this pseudo-scientist," my postgraduate friends tells me. However, in the same breath he adds: "But it's very unlikely we'll get anywhere. This Elkin is very well in with local Party people. He's a delegate to the Komsomol Congress and even Chairman of the Society of Young Scientists. And who are we? Nobodies. . . ."

Protvino, a small town 20 kilometres from Serpukhov, also reveals its true inner structure on the second and third day of the visitor's stay there. As in the case of Pushchino, it is an ultra-planned and multi-layered structure. The nucleus is the synchro-cyclotron which is said to be considerably more powerful than the one in Dubna. This diabolical merry-go-round is ringed by houses containing one- and two-storey apartments, garages, shops, kindergartens, scientific careers and scientific squabbles. The life of Protvino's 10,000 inhabitants is determined by the operational rhythm of the Institute of High Energy, and the Institute plus the town are a part of a still more august organization—the State Committee on Atomic Energy under the Council of Ministers of the USSR. Geographically, Protvino lies

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on the river Protva, a tributary of the Oka; politically, it intersects the state's two chief aspirations as an atomic power—atomic fear and atomic blackmail.

Everything in the town is aimed at captivating fully the young scientist's soul. On arrival in Protvino he discovers that, however wretched life may be in the surrounding villages, here in the town supplies are always decent (the atom!). He is informed that in two or three years' time he will be given an apartment, not a two-storey one, of course, but an ordinary one-room flat in a block. However, that is not to say he will never set eyes on a two-storey apartment with a hall downstairs and bedrooms upstairs—all he has to do is work a lot, reveal as little as possible of his innermost thoughts to those around him and obey his superiors. Of course, everyone here suffers from intolerable boredom; all topics of conversation have long since been exhausted and nobody goes visiting, or has gone for a very long time. A junior research officer cannot keep his wife, let alone a child, on his salary, and there is no work for his wife to do unless she takes a job as a concierge or a cleaner. Of course, if you are a junior researcher you can't expect a Doctor of Sciences to strike up a casual, informal conversation with you in the street or in the House of Scientists. All this is true. But it is also true that Protvino is a town for opportunities, a spring-board city. In time, six or seven years later, you will be able to spit upon this God-forsaken spot in the woods and head for the capital—and this is certainly what you ought to do. But meanwhile, not a word out of turn, not a gesture out of place, because the system in this atom-city has you under intensified surveillance. Every other person here is an informer. . . .

After my Protvino lecture (once again on the subject of "Why the Scientist Needs a Conscience") those nice young people enquired of their guest—not in the lecture hall but later in an intimate circle over a bottle of beer, and without the slightest passion or irony, out of sheer curiosity: "Why exactly should a scientist be an intellectual?" Not one of them agreed with the authors of the Oxford Encyclopaedia [9] (sic) who define the word "intelligentsia" as "the portion of society capable of independent thought." Independent thought? The boys round the table snorted ironically. In their profession of science they are obliged to check every idea that comes into their heads with the laboratory director (in return for which the laboratory director, a Doctor of Science, grants each of them a slice of the cake and allows them to submit and successfully defend a thesis). As for social or—God forbid—political ideas, let someone else do the thinking and talking there: physicists are forbidden to engage in politics and in any case they have no time.

[9] NB: Translator's note: The Shorter Oxford Dictionary in fact defines "intelligentsia" as "The class consisting of the educated portion of the population and regarded as capable of forming public opinion."

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Admittedly, they did ask me what I thought of Academician Sakharov and they appeared gratified that I respect Sakharov as a scientist and a public figure. Their own feeling is, however, that there are no social problems in science. Look at the laser, for example, an invention which was developed in both the Soviet Union and the United States: both sides pumped roughly the same amount of money into the process and both took approximately the same time. What has social structure to do with it all? The nice electrical engineer who expressed these views smiled at me condescendingly. He is convinced that science will forge ahead of its own accord. If a discovery is technologically ripe it is made irrespective of who governs the country or of what the radio says. Indeed, the inhabitants of Protvino are totally uninterested in what the radio says. But they must hammer out their Candidate's and then their Doctoral theses at any price. In this world there are rules and by adhering to them you gain access to your cherished goal. In their hearts the young despise these rules, but they have no intention of breaking them.

I would like to end my remarks on scientific reservations in the Soviet Union by citing an expert opinion. A few years ago a Polish woman sociologist Ya——skaya made a trip to the USSR. One of the places she visited was Akademgorodok. She was interviewed by Soviet newspaper reporters who, naturally, asked her the standard question: how did she like Akademgorodok? One would think that her answer could only be complimentary, but no—the sociologist from Poland said what was least expected of her: "Such cities should not be built," she asserted.

> We live in an imperfect world, a rigidly differentiated society. In big cities this differentiation, whether professional, financial or in the eyes of the law, is blurred, and this means that people from the lowest social strata do not suffer so acutely on account of their inferiority. Here in Novosibirsk differences in status hit you in the eye. An Academician always lives in a cottage, a Corresponding Member has half a cottage; a senior research officer has the right to an apartment with a three-metre ceiling height, while a junior officer has a two-and-a-quarter metres ceiling on an inconvenient floor with a communal bathroom and WC. You only have to point out the window of a scientist's home to define his social position, his rights, his resources and his prospects.

The Polish sociologist had put her finger on the main feature of Akademgorodok: the fate of the individual in an environment destructive of individuality. But what of us? Have the bosses of Soviet science realized that, unlike in the West, our experiment with scientific reservations has failed? I have talked about this to several directors of such cities and members of the Presidium of the Soviet Academy of Sciences. No, they do not see the situation as catastrophic. "Of course we have our difficulties, but as a whole . . ." As a whole, they believe, as does one of Chernogolovka's two bosses, Professor

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A. E. Shilov, that the afflictions of Soviet science cities are simply growing pains. Their own two-storey cottages with garage and hot water serve to a large extent as their justification for the existence of the whole town. As for the Party controllers of science, they all but idolize these cities, seeing them as symbols of all that is best in Soviet science. What is it that so enraptures them? When asked the straight question the Party bosses answer with vacuous phrases about "the cross-fertilization of the sciences," the atmosphere of enthusiasm among the inhabitants of Akademgorodok, Dubna and Pushchino. As we now know, there is not a trace of enthusiasm in them. However, there is something else, something they really value. In these science cities the researcher is even more dependent on the administration than in Moscow, Leningrad or Kiev; any display of private or public initiative is still less a possibility in these communities than in the major cities; public opinion has been reduced to nil and personal individuality in science is totally absent. In other words, in a scientific city Soviet science is *even more controlled* than anywhere else in the country.

Translated by Hilary Sternberg.

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Michael Josselson

1909—1978

MICHAEL JOSSELSON who died in Geneva on 7 January was a personal friend and supporter of *Survey* from its inception.

He was born in Estonia and educated in Germany and France. During the war he was an officer in the American army. Between 1950 and 1967, as the chief executive of the Congress for Cultural Freedom in Paris, he was indefatigable in supporting the cause of intellectual liberty against its enemies. For the last ten years of his life he was writing a book on the life of Napoleon's great opponent Field Marshal, Barclay de Tolly. In this work, which involved extensive research in Russian, German and French archives, he was helped by his wife Diana; he managed to finish it just before his death (a chapter from it appeared in the April issue of *Encounter*). In the last period of his life he greatly suffered from circulatory ailments and had to undergo several surgical operations. But in spite of the health troubles, he maintained all this time good humour and continued his intellectual activities. Until the end he remained in touch with his numerous friends all over the world.

They will remember his remarkable qualities, his warmth, his loyalty, and his steadfast courage in adversity.

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Our Contributors

RONALD AMANN is Lecturer in Soviet Politics and Science Policy in the Centre for Russian and East European Studies at the University of Birmingham, England. He is co-author of *Science Policy in the USSR* (OECD, 1969) and *The Technological Level of Soviet Industry* (1977) and has written extensively about the problems of promoting technical progress in the USSR.

KEITH BUSH is Director of Research at Radio Liberty in Munich. He has published over 100 articles on the Soviet economy and agriculture.

HERBERT I. FUSFELD is Director of Research, Kennecott Copper Corporation. Since 1974 he has served on the US-USSR Joint Commission for Scientific and Technological Co-operation and holds many consultative appointments, including that of Expert Consultant to the Department of State.

DONALD W. GREEN is an economist with Chase Manhattan Bank concerned with Eastern Europe and the USSR. He was Visiting Senior Fellow at the Russian Institute, Columbia University, 1976–77. While at the University of Pennsylvania he played a central role in the development of the SRI-WEFA Soviet Econometric Model. He is co-author of *SOVMOD I: A. Macroeconometric Model of the Soviet Union* (1977).

PHILIP HANSON is a Senior Lecturer in the Centre for Russian and East European Studies at the University of Birmingham, England. His publications include *The Consumer in the Soviet Economy* (1968), *Advertising and Socialism* (1974) and an Economist Intelligence Unit Special Report, *USSR: the Foreign Trade Implications of the 1976–80 Plan* (1976).

HERBERT S. LEVINE is Professor of Economics at the University of Pennsylvania and a consultant to SRI-International. He received his Ph.D. from Harvard University and has been a visiting professor at Harvard, Princeton, Columbia, Berkeley and the London School of Economics. Among his publications are "The Planning of Supply in Soviet Industry," *Mathematics and Computers in Soviet Economic Planning* (co-editor) and *Comparative Modernization of Japan and Russia* (co-author).

BRUCE PARROT is Assistant Professor of Soviet Studies at the Johns Hopkins School of Advanced International Studies in Washington, D.C. He is currently writing a book on the interaction of Soviet technological needs, domestic politics, and foreign policy since the fall of Khrushchev.

EUGENE ZALESKI is Director of Research at the Centre National de la Recherche Scientifique in Paris. He is the editor of *Revue d'Etudes Comparatives Est-Ouest*. His publications include "Central Planning of Research and Development in the Soviet Union" in *Science Policy in the USSR* (OECD, 1969), and *Planning for Economic Growth in the Soviet Union, 1918–1932* (1971).

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